

MOTOR AGE

Vol. XXVIII
No. 19

CHICAGO, NOVEMBER 4, 1915

Ten cents a copy
Three dollars a year

GRAY & DAVIS AMMETER



Actual Size. Price \$3.50

PRE-EMINENTLY the handsomest and most accurate Ammeter on the market. Moving coil type. Large, readable figures. Provided with adjustment feature. Will withstand heavy overcharge. Full nickel, gun-metal dial, registering 20 amperes "charge" or "discharge." Absolutely essential if you desire to know the *exact* condition of your electric system.

May be obtained from us or any of our Distributors. Descriptive literature upon request.

DEALERS

We are selling these instruments as fast as we can ship them. Write for particulars

GRAY & DAVIS, Inc.,

BOSTON, MASS.

Greater Motor Efficiency With Less Engine Trouble

BELONGS to motors that are equipped with gas-tight spark plugs. Car owners know that leaky plugs cause the engine to miss and knock, which seriously affects motor efficiency and is sure to bring on engine trouble.

Protect your motor from engine knocks and permit extreme spark advance with A C Plugs. Increased efficiency is the result, with more fuel economy and less motor wear.

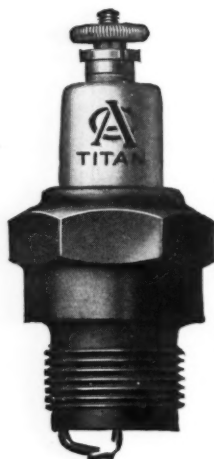
AC Spark Plugs Guaranteed Gas-Tight

are used by the leading automobile firms in the country. See the list below.

A C Spark Plugs are furnished

for *every* make of motor—bar none. Your dealer can supply you with exactly the same kind of A C Spark Plugs that De Palma and Burman win their races with.

Champion Ignition Company, Flint, Michigan



These Leaders Use A C Spark Plugs

Apperson
Brockway
Truck
Buick
Cadillac
Case Tractors
Chalmers
Chandler
Chevrolet
Cole
Davis
Dodge Brothers
Dort
Enger
Federal
Glide

G. M. C.
Haynes
Harley-Davidson
Hudson
Hupmobile
Jackson
Knox
Lambert
Lexington-
Howard
McFarlan
Moline-Knight
Monroe
Moon
National
Oakland

Oldsmobile
Paige
Packard
Paterson
Peerless
Pierce-Arrow
Pilot
Reo
Saxon
Scripps-Booth
Simplex
Stearns-Knight
Stutz
Velie
Westcott
Wilcox Trux



NEW DEPARTURE BALL BEARINGS

American Made for American Trade



Our catalogs cover every possible application of New Departure Ball Bearings in the design, care and repair of Motor Cars. Tell us your need, and the right book is yours.

THE NEW DEPARTURE MANUFACTURING CO.

Distributors in Trade
Centers Throughout
The United States

Bristol, Conn., U. S. A.

Conrad Patent Licensee

For Continent of Europe: Jacob Holst, Copenhagen, Freeport, Denmark

Sole British Agents
Brown Bros., Ltd.
London & Manchester

Western Branch: 1016-17 Ford Building, Detroit, Michigan

**Gil Anderson, (Stutz) Winner of Astor 350 Mile Cup Race
Breaking All World's Records, Averaging 102.6 miles per
hour, and *Every Car That Finished USED***



Oilzum



World's Greatest Race Drivers Use OILZUM
because it Lubricates Longer and Better and Leaves Less Carbon Than Other Oils

OILZUM VICTORIES IN 1915

	Distance, Miles	Speed	Winner	Car	Oil
First: In Grand Prix, Feb. 27	400.28	57.5 m.p.h.	Resta	Peugeot	Oilzum
First: In Vanderbilt Cup, Mar. 6	300.3	67.2 m.p.h.	Resta	Peugeot	Oilzum
First: In Venice Grand Prix, Mar. 17	300	68.5 m.p.h.	Oldfield	Maxwell	Oilzum
First: In Oklahoma City Road Race, April 29 ..	200	67.98 m.p.h.	Burman	Peugeot	Oilzum
First: In Chicago Auto Derby, June 26	500	97.6 m.p.h.	Resta	Peugeot	Oilzum
First: In Sioux City Speedway, July 3	300	74.7 m.p.h.	Rickenbacher	Maxwell	Oilzum
First: In Omaha Speedway, July 5	302	91.74 m.p.h.	Rickenbacher	Maxwell	Oilzum
First: In Des Moines Speedway, Aug. 7	300	87 m.p.h.	Mulford	Duesenberg	Oilzum
First: In Chicago Challenge Race, Aug. 7	100	101.86 m.p.h.	Resta	Peugeot	Oilzum
First: In C. A. C. Trophy Race, Aug. 20	301	74.97 m.p.h.	Cooper	Stutz	Oilzum
First: In Elgin National Road Race, Aug. 21 ..	301	77.25 m.p.h.	Anderson	Stutz	Oilzum
First: In Minneapolis 500-Mile Race, Sept. 4 ..	500	86.35 m.p.h.	Cooper	Stutz	Oilzum
First: In Narragansett Park Speedway, Sept. 18	100	67.11 m.p.h.	Rickenbacher	Maxwell	Oilzum
First: In Astor Cup Race, Oct. 9	350	102.6 m.p.h.	Anderson	Stutz	Oilzum

Reasons Why You Should Use OILZUM

An oil for use in automobile engines should have high flash test, so that it will remain as a lubricant under the existing conditions of high temperatures and heavy pressures. Oils having low flash evaporate and thin out quickly, thereby losing their lubricating value.

The argument that an oil should be of low flash, so that it will burn up quickly, is absolutely wrong, for if it burns up, more must be put in place of it, and of the oil that burns up quickest the greatest quantity is consumed; the larger the amount of oil that passes into the combustion space, the greater the liability to carbonize and cause smoke.

OILZUM Is the Motor Oil of Highest Flash Test

Lubricating oils, after being distilled and partially refined, are dark red in color. This reddish hue is caused by carbon in some form or other, either free or combined. By introducing an oil in this state into the cylinders there is a considerable deposit of carbon in a comparatively short time.

OILZUM Motor Oils are clarified and bleached, removing this coloring matter by a series of filtrations. This filtration process is by far the best, but is costly. Inferior oils resort to a less expensive method of bleaching, i.e., by means of sulphuric acid, the detrimental effects of which upon the cylinders, pistons and bearings need no discussion.

OILZUM Is a Strictly Pure Filtered Motor Oil

Ask for Booklet "Why Oilzum?" and Attractive Poster of Chicago 500 Mile Race

**THE WHITE & BAGLEY COMPANY, Worcester, Mass.
U. S. A.**

DISTRIBUTORS

Western Rubber & Supply Co., Los Angeles, Pasadena, San Diego, Cal.	Kansas City Automobile Supply Company, Kansas City, Mo.
Shaffer Auto Supply Company, Denver, Colo.	Francis Motor Sales Co., Milford, N. Y.
Universal Auto Company, Hartford, Conn.	Whittemore-Slim Co., 1976 Broadway, New York, N. Y.
Western Sales Agency, Boise, Idaho.	A. H. Marshall Co., Inc., Plattsburg, N. Y.
Excelsior General Supplies Co., 815 So. Wabash Ave., Chicago, Ill.	G. M. Toe Water & Co., Cincinnati, Ohio.
Wilcox & Herr, Inc., Indianapolis, Ind.	Rasmussen & Company, Portland, Ore.
Western Auto Specialty Co., Iowa City, Iowa.	Cahall-Fell Rubber Co., 833 No. Broad St., Philadelphia, Pa.
Bennett Auto Supply Co., Sioux City, Iowa.	Goodby-Rankin Company, 57 Washington St., Providence, R. I.
Darling Automobile Company, Auburn and Portland, Me.	Merchants Auto Storage Co., 18 So. Fourth St., Memphis, Tenn.
Green & Sweet Co., 737 Boylston St., Boston, Mass.	W. T. Wroe & Sons, Austin, Texas.
The Tarbell-Watters Co., Springfield, Mass.	Sanders Bros. Co., Richmond, Va.
	Comet Motor Co., Ltd., Montreal, Quebec.



Published by the
CLASS JOURNAL COMPANY
910 South Michigan Avenue
CHICAGO ILLINOIS

YEARLY SUBSCRIPTION RATES.

United States, Mexico and U. S. Possessions.....One year \$3.00
CanadaOne year 5.00
All Other Countries in Postal Union.....One year 6.00

BEWARE OF SUBSCRIPTION SOLICITORS OFFERING PREMIUMS OR
CUT RATES!

All currency should be sent by registered mail.

SUBSCRIPTIONS received up to the 15th of the month are begun with first issue of that month; those received after the 15th start with first issue of the following month.

RECEIPT of first copy is acknowledgment of subscription.

RENEWALS or CHANGE OF ADDRESS should be sent two weeks in advance of date they are to go in effect. Be sure to send old as well as new address to avoid unnecessary delay.

Volume XXVIII

November 4, 1915

No. 19

C o n t e n t s

A PROMISED ROAD TO THE LAND OF PROMISE.....	5
Intimate pen-picture of the Dixie highway dedicatory trip from Chicago to Miami.	
LINCOLN HIGHWAY REPORTS SHOW EXPENDITURES.....	13
Second year's work compares favorably with that for the first	
EDITORIAL—PREPARING FOR FROST—REGULATING TRAFFIC IN THE SMALLER CITIES.....	14
BAY STATE PROPOSES RAISING VEHICLE REGISTRATION FEES...	15
Measure would tax on capacity weight and also on actual horsepower	
MORE RATIONAL SPEED LIMITS.....	16
Reckless motoring—Safety semaphores	
RESTA WINS CENTURY AT SHEEPSHEAD BAY.....	16
Sets American record of 105.39 m.p.h.—Burman second; Rickenbacker third	
CHARGES FRAUD IN FENDER HEARING.....	18
Says money was not used properly, when heard at judiciary committee meeting	
NEW YORK HAS HYPHENATED LICENSE TAG.....	19
Thousands are separated from hundreds—Zone system will give prefix to numerals	
EIGHT CYLINDER ENGINES VS. TWIN SIXES.....	20
Crawford of Cole presents octuple side of multiple engine motor argument to Hoosier S. A. E.	
STOCK MOTORS ARE VERY MUCH IMPROVED FOR 1916.....	23
Past year has seen most rapid development of engine design in history. New types are more efficient and easier to keep in good condition	
EDWARDS CARBURETER TEST SHOWS ECONOMY OF 28.9 m.p.g....	31
With same setting five-passenger Buick six travels 58 miles per hour on country road	

DEPARMENTS

See America First.....	15	The Accessory Corner.....	42
Routes and Touring Information	32	From the Four Winds.....	44
Repair Shop.....	37	Among the Makers and Dealers.	46
Readers' Clearing House.....	38	Agencies Appointed.....	48

"Advertise It Now!"

1916 promises great things in the motor car industry. Nearly 2,500,000 cars in daily operation throughout the United States — something like 60,000 new cars being added to this number every month—insures a steadily increasing stream of business.

Consistent advertising is the force which will divert a part of this tremendous business to you, and remember—you are not advertising for today alone, but building for the future.

"Advertise It
Now!"

Motor Age
910 S. Michigan Avenue
CHICAGO

—the **ONLY** seven-passenger,
FORTY Horse Power, 4-cylinder
car that has ever been offered in
America or Europe at less than
\$1000!



—the **ONLY** seven-passenger,
FIFTY Horse Power, 6-cylinder
car that has ever been offered in
America or Europe at less than
\$1450!

—a **COMPLETE** line of cars, com-
prising closed cars for winter use as
well as touring cars and roadsters,
and offering the most astonishing
VALUES that the industry has
ever seen!

—such is the opportunity that the Studebaker Line offers a progressive dealer. Merchants are dropping other lines of business to become Studebaker Dealers solely for the opportunity that we offer.

And we urge every active man of business with vision enough to see the possibilities of handling the best-selling line of cars that 1916 has produced, to write at once for complete details.

Four-Cylinder Models

Touring Car, 7-passenger \$885
Roadster, 3-passenger - 850
Landau-Roadster, 3-pass. 1185

Commercial Cars

Panel Delivery Car - - \$875
Open Express Car - - 850
Station Wagon - - - 875

Six-Cylinder Models

Touring Car, 7-passenger \$1050
Roadster, 3-passenger - 1000
Landau-Roadster, 3-pass. 1350
Coupe, 4-passenger - - 1550
Limousine, 7-passenger - 2250
F. O. B. Detroit

STUDEBAKER

South Bend, Ind.

Detroit, Mich.

Walkerville, Ont.

Address all correspondence to Detroit



A Promised Road to the Lands of Promise
by J. C. Burton

"We are building a highway, sweet to travel or tarry upon; built in the hope that it will lead to better things; conceived, in the broad impulse of our desire, for closer friendships and better understandings, wherever the highway leads."

MIAMI, Fla., Oct. 25—I had a dream last night. It is not copyrighted, so Griffith may use it in "The Birth of a Nation" if he so chooses. It might go big, as they say in theatrical circles, as an epilogue to that masterful film drama of civil war and reconstruction.

And this was my dream. There stood, beside my bed, two ghosts. Although as transparent as Marley's wraith to trembling Scrooge, I could see that one wore the blue and the other the grey of internecine strife. They were partially veiled in a cloud of dust, a cloud of dust kicked up by thousands of motor cars speeding across the states of Illinois, Indiana, Kentucky, Tennessee, Georgia and Florida, and they conversed, as ghosts are wont to speak, in rasping tones.

"Well, Mister Yank," said the ghost in grey, "times sure do change. Fifty years ago we all were at one another's throats. North of the Ohio river, Grant was a red hero. In the south, Lee was an idol. The skies were red with bursting shells and the flames of fired towns. Bugles trumpeted the bayonet charge. North spoke to South and South to North with the awful voice of thundering canons."

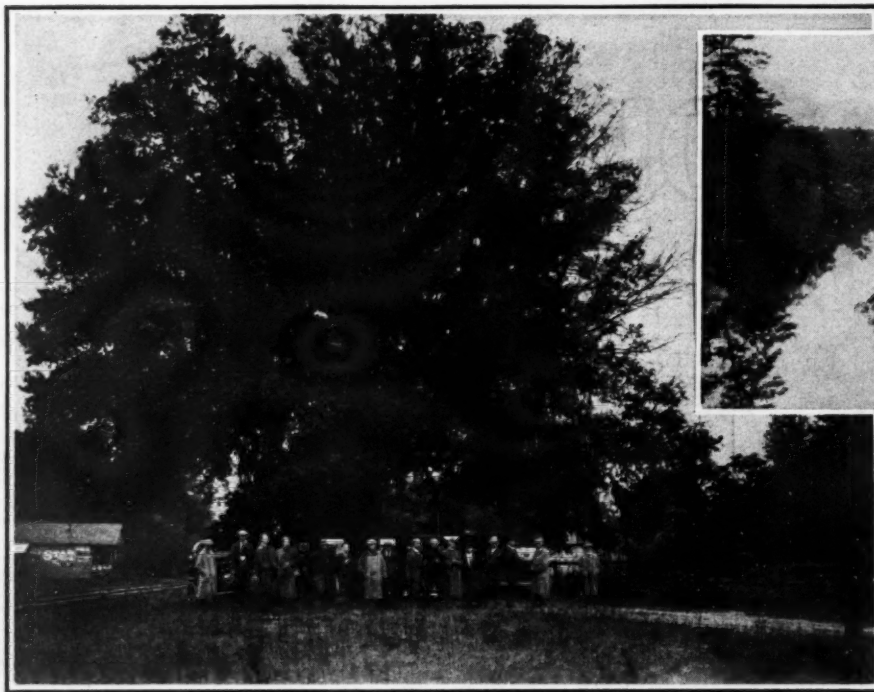
Ghost Answers Ghost

"You're right, Johnny Reb," the ghost in blue replied, "50 years make a considerable difference. Had you and I realized in 1861 that we were neighbors, living on the same street, you would not have slashed at me at Shiloh and my bullet would not have brought you down at

Gettysburg. There would have been no civil war, for neighbors live in peace."

And they looked out upon the common street, where the palm trees sway at the southern end and the oaks and cedars line the road at the northern approach, and heaved a common sigh of regret.

This is a story of the street on which the ghosts of my dream looked. It is a story of a recent tour taken over that street, a tour of 1,800 miles from Chicago, Ill., to Miami, Fla. It is a story of the Dixie highway as it is and as it will be; a story based on personal observations and conclusions reached after making those observations. Like the European war correspondent's articles and the vaudeville actor's conversation, it will bristle with personal pronouns for it is my intention to



Tree near stream at Live Oak, Fla., under which "Way Down Upon the Suwannee River" was written

write of what I have seen and heard in the past 16 days.

Conceived only a year ago and definitely routed in April, the Dixie highway of the present time is a wonderful project. It is more than a road on which motorists may travel from Chicago to Miami through one of the most scenic, historic and romantic sections of our country. It is an inspiration, a bond of friendship and good will between north and south, a link that makes pals of two peoples that were enemies only a half century ago.

Dixie Highway a Promised Road

I call the Dixie highway a promised road. It is not ready for the tourist at the present time. There are several stretches of it that are almost impassable. In all the United States, there is not as difficult a mountain ascent as that at the gateway to the Cumberlands in Tennessee where only three of the ten cars participating in the recent inspection trip by the Dixie highway commissioners succeeded in climbing through Hawkins' Cove on their own power. It is almost torture to stagger through the sands of northern Florida where the primitive trails are so narrow and the ruts so deep that the car grazes the trunks of trees along the roadside and reels like a drunkard, giving the impression that the garageman made a mistake and filled the fuel tank with moonshine whisky instead of gasoline.

Further south in Florida, there are places where the wheels of the machine sink below the hubs in the mire and water. In fact, not one of the six states that the western link of the Dixie highway crosses can boast of a perfect road from boundary to boundary. There is sporadic work to be done all along the line from Illinois to Florida.

Nevertheless, the Dixie highway is a

promised road that will be a thoroughfare of supreme reality very soon. Promises of improvements that have been made will be fulfilled in another year and 12 months hence the motorist will be able to travel in comfort and safety all the way from Chicago to Miami in any month of spring, summer, autumn or winter. It will be an all-year-around route, a dry weather route and a wet weather route, the most perfect motor road of its length of any in the country.

The name Dixie alone guarantees the fulfillment of these promises and the construction of such a road as that of which its conceivors dreamed. The man who christened the Dixie highway knew something of national psychology. He knew that the Dixie of 1915 is as dear to the descendants of the people of the North, who fought her, as it is to the offspring of the people of the South, who died for her. The song of "Dixie" is a national anthem. I once thought that the northern-born residents of Kalamazoo and Kankakee, who arose to their feet and shouted when "Dixie" was played in theater and cafe, were guilty of a spurious patriotism but I have changed that opinion. They worship Dixie for her gameness in the face of overwhelming odds in time of war and for her pluck and spirit when she was humiliated and ravaged by the carpet-baggers during that dreadful period of reconstruction.

Sentiment a Builder

Sentiment will build the Dixie highway. Sentiment has fired the enthusiasm of the people to a white heat in the half-completed project that means so much to north and south alike. It is not a fire of enthusiasm that will smoulder and die out, leaving behind only the ashes of repudiated promises and good intentions not carried



View of the Suwannee river near Live Oak, Fla.

out. There is enough fuel for the flames to keep the fire of enthusiasm burning until it is red with actual achievement. To date, \$11,000,000 have been subscribed or voted in bonds for the construction or improvement of Dixie highway roads and this vast sum will be spent immediately.

The construction of new roads and the improvement of old roads along the Dixie highway route is not as costly and difficult as one might imagine. True, the highway passes through counties that are sparsely populated and where the voting of road bonds is a drain on the pocketbook of the tax payers, but the mountaineers of Kentucky and Tennessee, the small plantation owner of Georgia and the struggling fruit grower of Florida all have made willingly the financial sacrifice that the same street on which the people of the North and the people of the South reside may be a credit and a pride to them, who are building it.

No Sacrifice Too Great

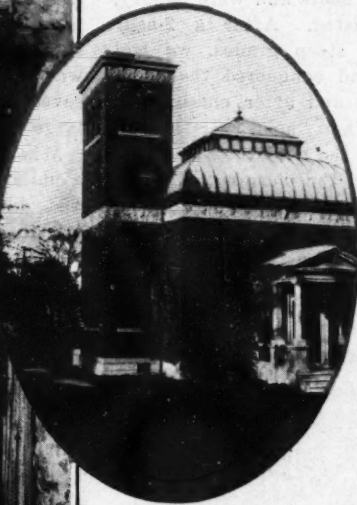
Nothing is too good for Dixie and the highway that has been named for her; no sacrifice too great to make for her and the road that will bring the people of the North to her. The enthusiasm of the South over the Dixie highway is wonderful. It is the spirit of '61; the spirit of what must be done, can be done; the spirit



A pair of Thomasville beauties



Dungeon door at Fort Morrison, St. Augustine, Fla. Oval—Library of Lew Wallace at Crawfordsville, Ind.



when put upon the road and crushed, make as good a surface as macadam. In the northern part of the peninsular state, the road builders can mix native sand with Georgia clay, which must be hauled only a short distance, and construct highways

rock and stone in the hills of Indiana and Kentucky and the mountains of Tennessee. Georgia engineers have discovered that by mixing the sand and red clay, indigenous to that state, they can build roads which are weatherproof and inexpensively maintained. Florida has tons of oyster shells that

that are equal to those of the commonwealth of cotton.

Another factor that will reduce the cost of road building in the South is the convict labor laws that are in force in Georgia and Florida where gangs of prisoners, dressed in black and white stripes, now are at work improving the Dixie highway in these two states. In addition the governor of Tennessee has been petitioned to allow convicts to construct the north and south thoroughfare in the Cumberland mountains and he has virtually promised to grant the request.

Kentucky's Problem Easy

Kentucky's problem is not difficult, being a task of resurfacing with native stone, a task that already has been begun, as evidenced by the 150 stone crushers and road building machines that I counted on the 180-mile run across the Blue Grass state. Between Louisville and Nashville, there is an old turnpike with a Telford stone foundation that is as good today as when it was laid by slaves almost a century ago. Built in 1832-35 under the direction of Sylvester West, an English army engineer, the Louisville-Nashville pike is

of each giving willingly that all may profit. One county, in the wilderness of the Cumberland mountains, has raised \$350,000 to build 32 miles of road. Another county, in northern Florida, with a population of only 4,000 and 30 miles of sandy trails to reconstruct, has voted \$150,000 for highway improvement. A widow, who owns 20 acres of land in Tennessee, has voluntarily contributed \$1,000 to the Dixie highway cause.

Same Spirit Prevails

The same spirit holds north of the Ohio river. In Illinois, Vermilion county will spend \$1,500,000 for the construction of brick roads in the spring. Further north in the same state, there is a wretched stretch of sandy road between Momence and Watseka that will be improved before another year. Until the Dixie highway was created, bond issue after bond issue for road improvement was defeated,

largely because of the opposition of the foreign element, but now the commissioners have been assured that funds will be provided at the next election. In southern Indiana, the work of highway reconstruction now is in progress, the grades being reduced, the crooked trails among the hills made straight and the roads resurfaced with stone and gravel.

Five of the six states through which the western loop of the Dixie highway passes are fortunate in that they have road building material close at hand and will not be forced to shoulder the heavy shipping cost. There is an abundant supply of



A Dixie admirer



Road leading to yacht club at Thunderbolt, Ga.—one of Savannah's resorts

an excellent example of scientific and efficient road construction. All it lacks at the present time is a top. It has lacked this for the past 50 years, since the day when the heavy artillery and munition wagons of the Union army rumbled over this historic artery of southern travel.

I already have written of the enthusiasm of the South over the Dixie highway as gauged by the dollars and cents subscribed and voted for the improvement of the road, of the work that has been planned or now is being prosecuted; but there is another standard by which that enthusiasm can be measured, a standard without the taint of the counting house upon it. It is the enthusiasm depicted all the way from Chicago to Miami by waving flags and blaring bands and cheering peoples.

High Lights Prominent

On the first inspection tour of the Dixie highway, there were certain high lights that stood out and stamped themselves indelibly on the mind like the smile of the Christ mother in Raphael's "Madonna" and the sad eyes of the Savior in Andrea del Sarto's "The Last Supper." I know

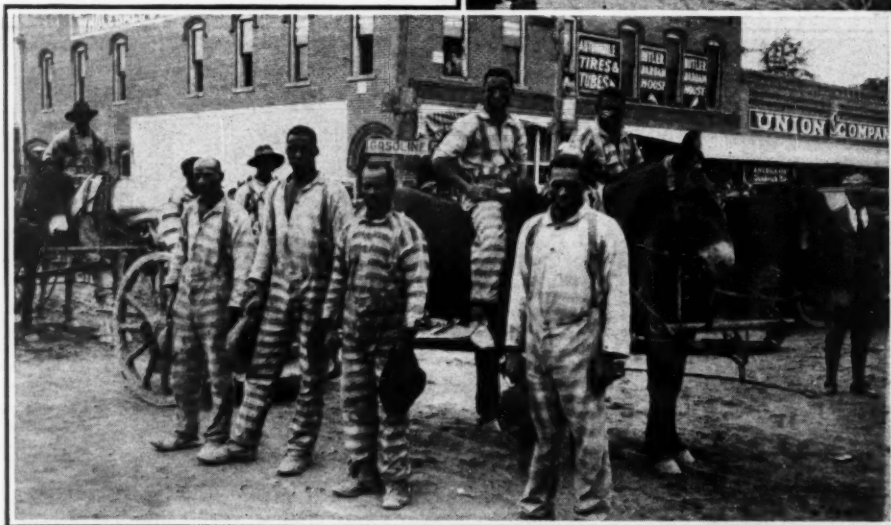
muscles and money to tackle. We had been riding for 18 hours and were hungry, sleepy and exhausted. After a 2-hour fight on slippery, steep grades, we had cursed, climbed and conquered the Cumberland mountains and after making the tortuous ascent, had splashed through inundated trails in the wilderness of pines. It was 2 o'clock in the morning. Chattanooga, the night's stop, was 20 miles away and we were approaching Rankin's Ferry, where the Tennessee was to be crossed.

strains of "Dixie," shy on proper tempo and long on discords. The source of the music was disclosed as we rounded a turn in the road. At a highway intersection was a boys' band, clad in overalls, and several of the members playing horns as large as they were.

When we arrived at the Berry school, a philanthropic institution where the sons and daughters of poor Georgia farmers are given an opportunity to get an education, we heard the story of that band



Convicts building streets at Camilla. This is one form of good roads work



Convict road gang at Camilla, Ga., which is doing much for the permanent improvement of the cotton state's highways

that I shall never forget them. They are in my heart.

It was in northern Kentucky, where perhaps they do not know that all Europe is at war and if they did, would not care, at twilight one evening that I first realized what the building of the Dixie highway meant to the isolated people of the hills. In the doorway of a weather-worn log cabin stood a little boy, not more than 7 years old, waving a home-made flag of red, white and blue calico and shrieking at the top of his lungs, "Dixie Ha-way, Dixie Ha-way." How many hours or days he had been waiting for us to pass, I do not know, but I judge that it had been a long, impatient vigil.

Two days later, I experienced another thrill and was convinced that the Dixie highway was something more than a road-building project, a proposition for minds,

As we neared the north bank of the river, the black sky suddenly became red. There was the thunder of exploding bombs, welcoming screeches from motor horns, yells of greeting from black figures gathered around a campfire on the opposite shore like the witches in "Macbeth." Chattanooga was out to guide us to our haven. Rain, mud and loss of sleep did not lessen the enthusiasm over the Dixie highway. I wondered if Chicago or Indianapolis would have displayed the same splendid spirit under similar circumstances. I doubt if they would. The Dixie highway does not mean so much to them.

Rome, a progressive little city of 20,000 inhabitants, was the noon stop on our trip from Chattanooga to Atlanta. When we were only a short distance from the base of lunch supplies, we heard the familiar

and forgot the discords and the poor time. It had been 3 weeks in the making, having been organized when the members heard that the Dixie highway officials were to pay a visit to the school. Two pieces had been practiced daily—"Dixie" and "Rock of Ages."

Boys' Band Greets Motorcade

To make matters worse, the boys learned that the citizens of Rome had engaged a military band to greet the tourists and fearing that musical, like all other comparisons, would be odious, had tramped 3 miles through the dust to play a selection of welcome before the better trained musicians joined the motorcade from the north.

If anyone ever tells me that all Georgia is not aflame with Dixie highway enthusiasm, I will think of the boys' band of the Berry school and condemn my informant to the Ananias Club with Rooseveltian vehemence.

I carried away from Georgia another lasting memory, a memory of a table at Thomasville heaped with beautiful Cherokee roses, and of a bevy of southern beauties, who filled our arms with red and yellow blossoms. As we rode away, the flowers falling from our car to be crushed by the machines that followed, one of the girls called out: "Don't forget us when you get back north." Her name was Carmen and for a fleeting moment, I forgot I was not eligible to play her Don Jose. Her voice was the voice of all Georgia,

all Dixie, and if you ever tour the Dixie highway, you will know how sincere that voice is. Perhaps, if you see one of the daughters of the South in the Thomasville garden of roses, you will be guilty of the same mental indiscretion as I.

The Face at the Window

But one more recollection of a sentimental journey and I am through. It was in Florida, on the run from Jacksonville and a few miles north of Cocoa, our night stop. We had been marooned in the morass of the jungles for 2 hours and it was almost 10 o'clock at night. Hunger was the spur that sent us bounding precariously over the deep-rutted roads and as we drew near an isolated house, I saw a light in the window. The feeble rays of a kerosene lamp disclosed a grey-haired woman, tapping on the glass with one hand and waving a small American flag with the other. There was a smile of welcome on her wrinkled face and a gleam of hope in her aging eyes. I recalled the little boy with the home-made flag in the Kentucky hills and I said to myself: "The

Ohio river unless you except the magnitude of hospitality. Touring through Dixie is a study of small details in a land where the present rubs elbows with the past, where the log cabin of Uncle Tom and the white pillared, colonial mansion of Norman St. Clair stand near the twentieth-century office building and metropolitan hotel.

There is no monotony of mountain and desert and prairie as in the West. The dissimilarity of the South is truly chaotic. There is no sameness about things to bore you and make your ride a tour of gapping ennui. Each log cabin, each old mansion, each negro that you pass, is differ-

of the Ohio river, you will have evidences of it on every hand. Kentucky is the land of Daniel Boone and the pioneers; Tennessee and Georgia, the theater in which the western drama of the civil war was staged; Florida, the cradle of the Spanish empire in North America and the magic realm of the Seminoles. Travel the Dixie highway and a scenic panorama is unreeled for you—the wooded hills of Kentucky, the pine-clustered mountains of Tennessee, the cotton fields of Georgia, the tropical trees and flowers of Florida.

Ride with me, if you will, on my tour of retrospection. If some of the adventurer's blood flows through your veins,



Cemetery on Stone river battlefield, Murfreesboro, Tenn.



One of the most popular methods of locomotion found in the Florida interior. Here the motor car has not made great inroads on the antiquated means of transportation

Dixie highway means a great, great deal to young and old alike."

A tour over the Dixie highway is a different motor trip from any other journey you can make. It is to pierce the hospitable heart of the most hospital people in the world, to receive the most genuine welcome that could be extended. Southern hospitality is no myth. It is as real today as in the ante-bellum days when the great mahogany doors of the white plantation mansion were open to every traveler, when strangers became friends after the first cooling julep was sipped.

Travel over the Lincoln highway or any of the transeontinental roads that lead to the Pacific coast and the greatest and most lasting impression is the magnitude of things—the height of the mountains, the expanse of the plains and deserts. There is no magnitude south of the

ent. Trees and hills, fences and fields have distinctive marks. You will never tire of looking. Your eyes always will find something new to attract you. You can tell when you have crossed the Georgia-Florida line by the change in the demeanor of the darkies. The negroes of southern Georgia apparently have profited little by the Emancipation Proclamation. They bow and scrape before the white man and call him "Master." In Florida, the black-skinned residents have forgotten that their's was a different condition of servitude prior to 1864 and govern themselves accordingly. They work for the Caucasian when they need money, but with \$10 in the pocket of their overalls, they watch the fruit rot on the trees and the cotton go to seed in the field with a laugh of disdain.

Wondrous history has been written in romantic Dixie and if you motor south

you will relish the trip. If not, you had better decline the invitation, as approximately 900 of the 1,800 miles are not ready for the fastidious tourist as yet. Touring is like golf and fishing. Some like sporty courses, fighting tarpon and rough roads while others prefer bunkerless links, docile carp and macadam boulevards.

Illinois Section Not Scenic

On the ride through Illinois, you will find nothing of piquant scenic or historic interest unless you search in Danville for the cigar stubs dropped by "Uncle Joe" Cannon, former speaker of the national house of representatives. The roads at the two termini of the run, Chicago and Danville, are permanently improved with brick and macadam and the remainder of the 150-mile trip is over natural dirt highways with the exception of a short stretch of sand between Momence and Watseka.

While the stone and gravel roads of Indiana offer few obstacles for the motorist to overcome, that section of the Hoosier state through which the western loop of the Dixie highway runs is virtually poverty-stricken when compared with the commonwealths south of the Ohio river, so historically and scenically rich are Kentucky, Tennessee and Florida. Crawfordsville, the seat of Wabash University and the home of General Lew Wallace, author of "Ben Hur" and "The Fair God," is



Bathers and onlookers at the "Queen of South Atlantic Coast Resorts"—Tybee Island, Ga., near Savannah

the point of most interest on the southeastward trip from Danville to Indianapolis. **Through Hoosier Hills**

On the run south from Indianapolis, the Dixie-bound motorist winds in and out among the Indiana hills and stops for luncheon at Bloomington, where the University of Indiana is located. This was Indian country and anthropologists have found many interesting relics in the mounds of this vicinity. French Lick affords a convenient and attractive night control. The famous spa, noted for the curative properties of its natural springs, once was an oasis in the wilderness for the Indians and the French explorers. Here they boiled their water and made their salt. Two or more centuries have passed since their time, however, and now the bar flies and the members of the 400, who have lived not wisely but too well, boil out there. French Lick is the Monte Carlo of America. At Brown's the fickle goddess of chance sings her siren song to the accompaniment of rattling dice and the whirling roulette marble as handsomely

gowned women and immaculately dressed men play their systems and attempt to break the bank. Brown's is a blinding



In the jungles of Florida

glare of electric lights, flushed with the gambling fever and scented with cloying perfumes.

The old Paoli turnpike, over which the mail coaches rumbled a century ago and the Knights of the Silver Circle rode to terrorize loyal Hoosiers and fire the homes of Union sympathizers in the early days of the civil war, is the link that joints French Lick with Louisville. The stone and gravel road winds among the green knobs of southern Indiana and after a run of 60 miles, the tourist crosses the historic Ohio river at New Albany, a typical river town, and enters Louisville, the gateway to romantic Dixie.

Although Louisville has been modernized in the past 50 years, it still retains much of the charm of the ante-bellum era. Military titles are distributed here with a prodigality that leads the tourist from the North to believe that only the majors and colonels survived the civil war. Here stands the old Galt House with its retinue of grey-haired, bowing, deferential colored servants; the Galt House where the Kentucky colonel sold his tobacco, praised his horses, drank his julep and gambled away his fortune; the Galt House where General Nelson was shot after he had won Kentucky for the Union.

Scenic Kentucky a Pleasure

The 200-mile ride across Kentucky to Nashville is a scenic tour through the hills of the Blue Grass state, hills that are the western extension of the Blue Ridge mountains of Virginia. It is the country of the feudist, where family quarrels of the most trivial nature still are settled with pistol and squirrel rifle; where the descendants of century-old factions refuse to "tich glasses" when they drink although they have declared a mutual truce.

A few miles south of Louisville, the Salt river is crossed at West Point, Ky. The Salt river is the one stream that the most sea-faring politician shuns, for to sail up Salt river is to be lashed to the mast of obscurity with ropes of defeat. Salt river first came to the notice of the office-seeker in 1832 when a boatman piloted Henry Clay up that stream instead of down the Ohio to Louisville where the Bryan of the Jacksonian era was scheduled to make the last speech of his presidential campaign.



Georgia log cabin and southern dandy of ante-bellum days. Many such structures are to be found in the state famed for cotton

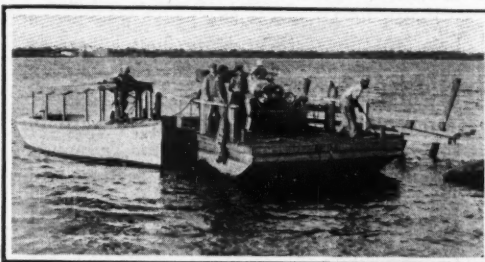


The garden of roses at Thomasville, Ga.

To the fact that he did not reach Louisville in time to address the meeting, Clay ascribes his defeat.

If you do nothing else on a tour of the Dixie highway, stop for a day at Elizabethtown, a most picturesque Kentucky town and one of the few places that I know of that has not been modernized by the moving picture. The smile of Mary Pickford and the flapping trousers of Charley Chaplin are not known here. Elizabethtown of 1915 is the Elizabethtown of 1860. It is a town of characters. The judge is the judge of the Kentucky novel and drama; to see the negroes, to hear them talk is to scream with laughter. At the hotel are a stuttering porter and a bleached-skinned bellboy that are funnier than McIntyre and Heath ever could be.

"Could you all let me shine your shoes before that stuttering porter gets here?" the bellboy asked me one morning.



Crossing San Luis river, near Stuart, Fla.

"What's the matter with the stuttering porter?" I parried, "Can't he shine shoes?"

"Yes," the yellow-skinned servitor drawled, "but I could shine 'em while he was asking you could he."

There seems to be a great deal of rivalry between the bellboy and the stuttering porter. The former told me as much, when he said:

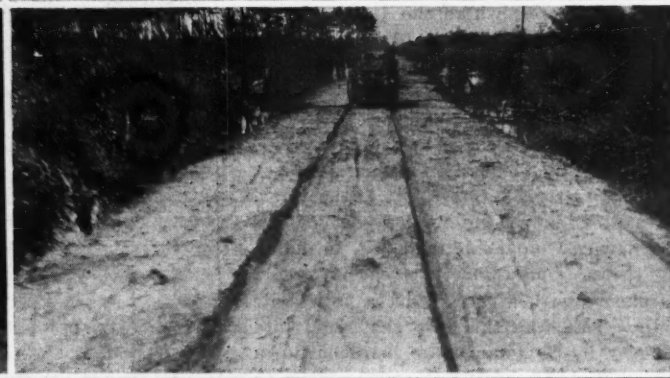
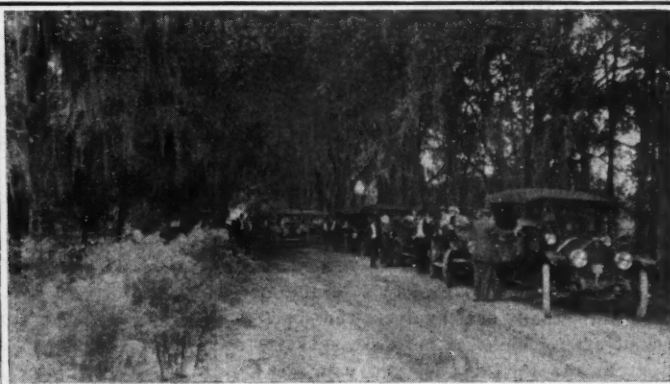
"That stutterin' porter! Everything I do, he undo."

Munfordville is another historic stop on the trip to Nashville. Just a short distance back from the main street is the ancient inn of logs where Andrew Jackson stopped on his ride from Nashville to Washington to be inaugurated president of the United States. In the hills surrounding the town are the trenches dug by blue and grey a half-century ago.

Soon after leaving Munfordville, the Dixie highway tourist can make two detours to interesting points. One is an 8-mile trip to the Lincoln farm where the cabin in which the great emancipator was born has been preserved for posterity and the other is a 12-mile run to Mammoth Cave, the most famous subterranean cavern in the world.

Just before crossing the boundary line into Tennessee, Adairsville is reached. This was the scene of the Jackson-Dickinson duel in which "Old Hickory" killed his opponent, after being wounded in the first exchange of shots, and the place where was held the convention at which Kentucky finally decided to secede from the Union.

When you arrive at Nashville, you are in the home city of Andrew Jackson. The Hermitage, a fine old colonial mansion where he resided, still stands here and he



Top left—Pine needles used in Florida road building. Right—Florida road festooned with Spanish moss. Bottom left—A Florida swamp. Right—Sand trail between Tallahassee and Jacksonville

is buried close by. Nashville also was the scene of a decisive battle during the civil war and the field of conflict has been marked by monuments.

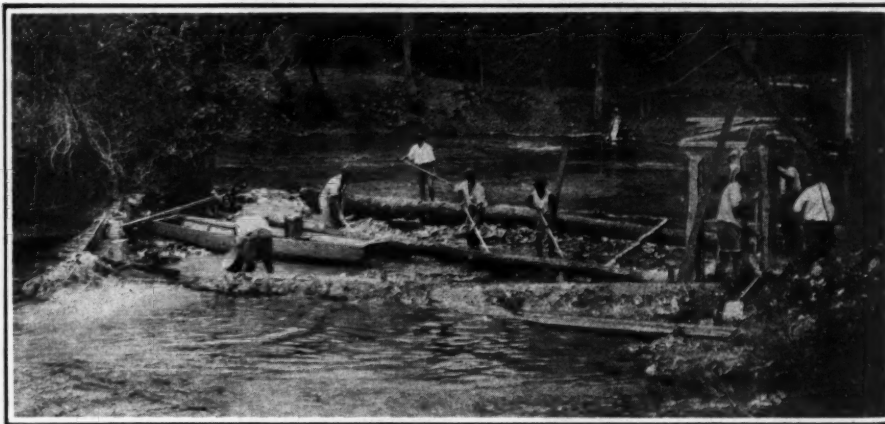
The drive from Nashville to Chattanooga is through the Cumberland mountains and over primitive roads that pierce dense forests of pine. The most historic place on this trip is the battlefield of Stone River, near Murfreesboro, where a national cemetery has been established. I had no opportunity to study the beauties of the Cumberlands, for I rode through them at night, but from afar they seemed warm and hospitable, the very antithesis of the Rockies, which are cold and distant.

Battlefields Near Chattanooga

At Chattanooga the tourist should spend 2 days at least in sight-seeing, for in the vicinity of this city several of the most spectacular battles of the civil war were fought. Ramble over Chickamauga park where General Thomas "stood like a rock" on Snodgrass hill; ride on the crest of Missionary Ridge over a road that has been constructed on the last line of Confederate trenches; climb Lookout mountain where Hooker's corps pierced the clouds to plant the stars and stripes on the highest point and you will be convinced that Sherman was right when he defined war as hell.

The trip from Chattanooga to Atlanta is over the toll roads of Tennessee and the red clay highways of northern Georgia. For the first 20 miles you follow Sherman's route, but at Lafayette, the Union commander swung off to the east and followed the railroad. You travel in his historic footsteps once more, however, on reaching Cartersville and just north of Marietta, the two peaks of Kennesaw mountain stand out against the background of the blue southern sky. If you climb to the top of one, you can see a hole in the rock where the Union signalman put the staff of his flag and waved to General Corse at Allatoona "Hold the fort, for I am coming."

After leaving Atlanta, you ride over the finest natural roads in the country to Macon, a convenient night stop and a place of great historic interest. It is the birthplace of Sidney Lanier, the poet of the south, whose old homestead still is standing there. On Mulberry street is an old warehouse with a great hole in one of its walls. This was the only shot fired into the city by Sherman as he marched down the south bank of the Ocmulgee river to Savannah and the sea. On the outskirts of Macon are the ruins of the only per-



Natural body of clear water near Blue Spring, Ga., that empties 70,000 gallons a minute

manent arsenal that the Confederacy established. To the old Lanier hotel, Jefferson Davis was brought a prisoner and it was here that the president of the Confederacy made his last speech.

South of Macon is the peach and pecan belt of the historic state noted for its cotton in 1861 and for its consumption of coca cola in 1915.

When you come to Florida, you are in the last frontier of Uncle Sam, a magic realm that beckons to the settler and

without the snow-capped mountains. The Spanish atmosphere is here, the Spanish architecture, the Spanish languor.

The ride across the northern part of Florida, from Tallahassee to Jacksonville, is not especially pleasant. The trails are sandy and narrow, the country is sparsely populated and there are few places of historic interest to cause the tourist to tarry by the way. Just before reaching Live Oak, the Dixie highway crosses the Suwannee river, on the east bank of which stands the tree under which the song of the old plantation singers was written. A few miles farther east is the monument erected on the battlefield of Olustee, where, in one of the bloodiest fights of the civil war, the southern troops stopped the western march of the northern army after Jacksonville had been shelled and captured.

Good and Bad Roads

From Jacksonville to Miami, the southern terminus of the Dixie highway, there are good roads and bad. For 50 miles the brick highway along the east coast permit the driver to open up the throttle to the last notch and the natural shell roads, farther south, are easy to negotiate. But in the swamps, there are narrow paths covered with decayed vegetation and water which are almost impassable in wet weather and corduroy trails through the jungle wilderness that jolt all the enthusiasm out of the tourist.

When the roads are improved, the tour from Jacksonville to Miami will be most inspiring. Along the way there are dense forests of palm trees and tall, slender pines, grey with festoons that make one believe that he is in Africa, not America, and when the tropical moon shines through the foliage, you look for a Numidian lion and expect to see monkeys hanging from the branches overhead.

At twilight, the cloud effects are beautiful. As the sun sinks below the horizon, the summer sky is veiled in filmy draperies of soft delft blue and salmon. In the broad rivers, estuaries of the Atlantic, are small islands, dotted with palm trees. It seems a sort of sacrilege to hurry on. You are in a realm of romance, where to



Map of Dixie highway

enjoy life to the very fullest is to dream.

A visit to St. Augustine, a settlement founded by the Spaniards in 1512 and the oldest, quaintest city in the United States, alone is worth the trip down the west coast. The streets are narrow and some of the ancient dwelling have the coat of arms of the Arragons above the doors where the brass knockers are green with age. The old Spanish fort is a day's study in itself. You live history over again there. You suffer the fiendish tortments of the captives in the torture chamber. You look out upon the sea with the eyes of the betrayed Seminole chief, Osceola, from the niche above the entrance to the commandant's council room.

Father south is the broad racing course Daytona, the finest natural racing course in the world, where Barney Oldfield and Bob Burman made speed history; Palm Beach, most exclusive of all winter resorts; Stuart, on the bay of the San Luis river, where all the warships of the world could ride an anchor; and finally Miami, the magic city on the shores of the Atlantic.

Before me, as I write, lies the menu of a luncheon tendered the Dixie highway commissioners on their recent inspection trip by the citizens of Rome, Ga. On it is the best definition of the Dixie highway that I have found in my tour from Chicago to Miami. It is reproduced at the beginning of this article.

OHIO GARAGEMEN ORGANIZE

Columbus, O., Oct. 30—In an enthusiastic meeting of more than four score garage owners and accessory dealers of the Buckeye state, held here last week, a permanent organization of the Garage Owners' Association of Ohio was perfected. Interest was held at a high point throughout the 2-days' session and when the members left for their homes they were fired with the ambition to organize local bodies of garage owners whenever possible.

E. J. McGuirk, organizer for the Associated Garages of America, together with L. C. Steers, secretary of the Garage Owners' Association of Michigan, were present to aid in the organization.

MOLINE BUGGIES WILL BE CONTINUED

Moline, Ill., Nov. 1—Notice that the Moline Plow Co. was going to build a passenger car at its buggy factory in Freeport, seems to have conveyed the impression that the company was discontinuing the manufacture of buggies. This is erroneous as it expects to continue manufacturing a full line of buggies at Freeport in the plant of the Henney Buggy Co.

Heretofore it operated two buggy factories in Freeport, the Henney Buggy Co. and the Freeport Carriage Co. Last year it was decided to consolidate the two buggy factories and have its entire line of buggies and vehicles manufactured by the Henney plant.

Lincoln Highway Reports

Shows \$2,250,000 Expended on Transcontinental Road

Second Year's Accomplishment Greater than First

DETROIT, Oct. 29—The Lincoln Highway Association has just made its second annual report, which shows that \$2,250,000 already has been expended upon the transcontinental route. The past year naturally has not shown as obvious progress as it did the first year. The first flush of enthusiasm which is peculiar to Americans and which is aroused more or less easily over any project which appeals at the same time to their patriotic sentiment, national pride and desire for accomplishment on a big scale, has passed. There always is a danger that when this enthusiasm subsides, it may leave the project which is undertaken with so much confidence stranded on the rocks of public indifference.

In the case of the Lincoln highway, it is worthy of note that the second year of the propaganda, instead of falling short of the accomplishments which marked its establishment and the first year of progress, on the contrary has witnessed an even greater development during the past year, although in a quieter and less spectacular way. The hurrahing and red fire of the first year which was necessary to arouse the public has been superseded this year by a quiet and efficient program.

The work has been concentrated upon three main points: The marking of the route, its improvement in hard surface material and the dissemination of educational literature and publicity to mold public opinion to the idea of expending funds upon roads leading from one definite point to another.

Marking Almost Complete

To all practical purposes the marking of the Lincoln highway is complete from New York to San Francisco according to the report. Considerably more than half of the two and a quarter million that has gone into construction of the Lincoln highway has been expended during the past twelve months. Seedling miles of concrete have been constructed at various points and are having their influence.

Improvement of accommodations along the route is an indication of both the improvement in road conditions and the quantity and quality of travel over it. Hotels are enlarging and bettering the accommodations which must be offered to the tourist. Garages and supply stations may be found at frequent intervals.

The financial summary for 1915 shows receipts of \$28,730.21, of this \$16,000 are donations by the founder, including Henry B. Joy, R. D. Chapin, Carl G. Fisher, A. Y. Gowen, F. A. Sieberling, John N. Willis,

James A. Allison, Arthur Newby, T. Coleman DuPont and Henry E. Bodman. The rest of the income is from sales of penants, buttons, radiator emblems, etc. In addition contributions of cement to the extent of 33,000 barrels have been made by cement companies and 7,900 barrels already have been used on the road. Taking all of these items into consideration, the association was in receipt of \$37,785.55 during 1915. The average operating expense for 1915 has been \$2,129.64 per month.

CALIFORNIA'S COLLEGE MOTOR CLUB

Los Angeles, Cal., Oct. 30—The first college motor club on the Pacific coast has been organized at Occidental College here. From the president of the college down, the Oxy students are enthusiastic motorists. There are so many machines on the campus that a large garage has been constructed for the use of the students and faculty members who drive machines. From the most expensive cars to stripped Ford raceabouts are to be found in the college garage and the cars on the campus have increased so fast within the last few weeks that a second garage now is being built.

In addition to promoting interclass and intercollegiate runs and tours, the club is to have charge of all parades, be responsible for the transportation of all visitors and visiting athletic teams, transport the Occidental teams to all games played within the boundaries of southern California and maintain traffic regulations on the campus. A motorcycle officer has been appointed who is responsible for the traffic regulations on the campus and offences are handled the same as any violation of a rule of the faculty.

Mufflers must be kept closed on the campus at all hours, no parking is allowed in certain sections of the grounds and athletic field, the speed limit is regulated and reckless driving is prohibited.

The first club run now is being developed. It is to be an interclass affair and will include a visit to all the colleges in southern California, namely, the University of Southern California, Whittier College, the University of Redlands, Pomona College, finishing at Occidental.

SET RECORD AT LOS ANGELES SHOW

Los Angeles, Cal., Oct. 28—Attendance record have been broken and business resultant from the Broadway Automobile and Flower Show, which opened last week, has been greater than at any similar event held here before.

At no show ever held in southern California have dealers made so many sales and for the first time, factory men at attending in Los Angeles.

Plans are on foot to put this city in the big circuit next year, with a large factory representation. The attendance to date is over 100,000, and it is believed it will reach 150,000 by the closing night.



MOTOR AGE
Published Weekly by
THE CLASS JOURNAL COMPANY
910 SOUTH MICHIGAN AVENUE CHICAGO

NEW YORK OFFICE
239 West 39th Street

SUBSCRIPTION RATES
United States and Mexico
\$3.00 per Year
Canada \$5.00
Other Countries \$6.00

Entered as Second-Class Matter September 19, 1899, at the Postoffice at Chicago, Illinois, under Act of March 3, 1879

Member of the Audit Bureau of Circulations

Copyright, by the Class Journal Co., 1915

Circulation Audited and Verified December 8, 1914

Preparing for Frost

THESE are the days when the anti-freezing solution should be put in the radiator. It is foolish to wait longer. The mixture has to be used all winter and so avoid the early freeze as well as the late-spring one. Already the shrewd car owner in several of our northwestern states has added the solution, but there are tens of thousands of others who have not yet taken this precaution. If an owner is caught short-handed without the necessary mixture it is best to drain the radiator and entire water system each night, or a few of the very cold nights until the mixture can be obtained.

ALREADY the many patented types of radiator and hood covers are being seen. These are very essential. The gasoline engine is a heat engine and it is imperative to have the heat conditions as high as can be used. Keeping the engine warm is as essential in cold sections as having any part of the mechanism in good condition. More and more are owners realizing the necessity of looking after this phase of the car. This winter will see a more general use of cars than heretofore, due to more cars being in use and also due to more closed body types and more of the detachable type of winter body. While looking after himself the car owner should not fail to look after the motor also. He can hardly expect to get the same efficiency out of his engine in winter as he does in summer unless he takes the precaution of supplying it with certain standard articles that will compensate for the difference between winter temperature and summer heat.

SELF-STARTERS in a high percentage of cases will do their work nearly as efficiently in winter as in summer but the driver must have mercy on the battery otherwise on some cold morning he will entirely exhaust the battery supply, vainly turning the cold engine over, yet failing to get an explosion. In such case, the starter has done its work admirably, but the carbureter has failed. If your carbureter has not a hot-air pipe you will find it desirable to have such attached for the benefit of general running. For starting, the shutter valve is quite essential. It obstructs the air passage and thus puts a heavy suction on the gasoline in the nozzle thereby drawing out a lot of gasoline in proportion to the volume of air and giving a rich mixture which is essential for starting. When the motor is started, the shutter valve is opened and soon the necessary richness of mixture is obtained. There are some makes of carbureters that in addition have provisions for lifting the needle valve out of the carbureter nozzle, the object being the same.

IT is foolish to expect a self-starter to arrange for the necessary richness of mixture as well as turning over the crankshaft. If it rotates the crankshaft it has done its part; but, do not vainly imagine that continuing to rotate the crankshaft for a minute or more will do the job. It may be necessary to prime the cylinders, flood the carbureter or hold a rag saturated with gasoline over the air opening. Be sensible to your starter and to the battery.

Regulating Traffic in Smaller Cities

THE time is ripe for better traffic regulation in cities of 25,000 population and over. Already the corner policemen who lets traffic go first in one direction and then in the cross direction is appearing, but local motoring interests should accelerate the movement. Instead of the policeman with his confusing whistle, it is much preferable to have the traffic semaphore, which is now coming in for very general use in nearly all of the larger cities. The semaphore is immeasurably superior to the policeman with his arm signals and whistle. At best, the whistle is confusing and while a few motorists may burden their memories trying to remember whether one whistle means clear street east or west, or if it means clear street north or south, thousands of pedestrians make no effort to follow such signals. The pedestrians see the semaphore. They unconsciously halt to see whether they should go ahead or not. In this respect the semaphore is going to be a big educator. The pedestrian rarely understands the policeman's whistle. The pedestrian has a feeling of confidence with the distinct semaphore that is high enough to be seen over the top of a taxicab.

MOTOR CLUBS in a score of cities could not do better than bring the attention of the traffic semaphore to the notice of the police departments. This has already been done in some relatively small cities with good results. The police department

in one city accepted the suggestion in good grace and put into immediate use the semaphore that the club presented.

THESE are days of too numerous motor car accidents and every suggestion coming from the motorists can only be construed as a desire on their part to see the law enforced and also to lend their aid in enforcing it. It is the proper spirit in which to approach the police department. It is positive legislation that makes it easier to own a car and very much easier to operate one. Not only should motor clubs actively take up this work but they also should insist on motorists using a set of hand signals for driving such as illustrated in Motor Age September 23, page 10. Such signals get motorists in the habit of being safe on the highway and having regard for others who are also on the highway. It is the building up of this habit that is so desirable. Strengthening such a habit surely will be a strong force acting positively to reduce the possibility of accidents.

IT seem probable that something might be done toward eliminating accidents by the passing of laws prohibiting the crossing of streets in the middle of blocks. It might take the strict features of martial law to do this but the idea is worth consideration.

Bay State Proposes Raising Vehicle Registration Fees

Measure Would Tax on Capacity Weight and Also on Actual Horsepower—
Means Advance of 50 Per Cent in State's Revenues

BOSTON, Mass., Oct. 30—No more drastic suggestion for legislative action was ever proposed than is found in the tentative draft of a measure designed further to increase the taxes on motor cars in Massachusetts. When the few motor representatives, who appeared at a hearing Thursday to oppose the idea, read the bill, they were very much amazed. Not one of them ever dreamed that such ideas would be formulated let alone arranged for a hearing. The matter came before a special committee appointed by the last legislature to devise ways and means of increasing the state taxes, and motor cars seemed to be worth consideration. The committee has the power to make recommendations to the legislature, and such ideas as a recess committee formulate are given much attention. Few of the motorists knew anything about the proposed plan, and so there were but five men present to oppose it.

The measure begins by eliminating Section 29 of the present law and proposing an entirely new one as follows:

Section 29. The commission or its authorized agents shall collect fees as follows:

For the registration of every motorcycle, including the right of the owner thereof to operate the vehicle, \$3.

For the registration of every motor vehicle equipped in whole or in part with hard tires of rubber, metal or other material, 30 cents for each 100 pounds of the weight of the vehicle and its load when loaded to its full or normal carrying capacity, and 50 cents additional for each horsepower developed by the motor at its full capacity.

For the registration of all other motor vehicles, whether used for commercial purposes or otherwise, 25 cents for each 100 pounds of the weight of the vehicle and its load when loaded to its full normal capacity, reckoning the average weight of each passenger at 150 pounds, and 50 cents additional for each horsepower developed by the motor at full capacity.

For the registration of motor vehicles owned or controlled by manufacturers or dealers or owned by a non-resident, for the substitution of registrations, additional copies of certificates and additional number plates or seals the fees prescribed in said chapter 695 of the acts of the year 1914.

For every chauffeur's license, \$3. For each renewal of such license, \$1. For each original owner's license to operate motor vehicles other than motorcycles, \$5.

For each renewal of the same \$2, provided, however, that copies of certificates and other documents relative thereto may be supplied without charge to public officials, and original certificates and licenses may be used without charge to members of the foreign diplomatic corps, as provided in said chapter 695.

Section 2—Fifty per cent of the increase in fees prescribed by said chapter 695 shall be retained by the highway commission and supplied to the maintenance of the state highways, and the remaining 50 per cent shall be distributed annually in November to the several cities and towns in the commonwealth in proportion to the mileage of main thoroughfares, not state highways in each municipality that during the 60 days preceding are found by the commission to be oiled or otherwise rendered waterproof and water resisting and maintained in a satisfactory condition.

This act shall take effect January 1, 1917.

After glancing at the provisions the motor opponents tried to figure what the increase meant. One of the members of the committee volunteered the information that it was so drawn as to net the State at least 50 per cent additional revenue

but in the greater majority of cases it would go above that. For example, a 5-ton truck would pay on its load and weight, estimating it to be a total of at least 14,000 pounds, would pay some \$42 on that basis and an additional \$20 if it had a 40 horsepower motor. That makes \$62. And today it pays \$17.

On the cars the jump would be big, too. A 30-horsepower car now pays \$15. On the horsepower basis it would pay the same fee, but the weight would add on \$6 or \$7 more. Instead of getting the same fee for all cars between 20 and 30, or 30 and 40, etc., horsepower, it would be graded to produce a little more than 28 horsepower, for example, paying \$14 instead

of \$10 as now, and others in proportion.

Of course the motor representatives objected strenuously. John B. Sullivan, Jr., who represented The Boston Automobile Dealers' Association and The Boston Commercial Vehicle Dealers' Association, stated that the organization he represented would fight any proposed bill as planned. He told the committee the limit had been reached in taxing the motor industry, and to go further would bring about a test case with the probability of the State losing a lot of its revenue gathered each year. That it was clearly unconstitutional, he argued, and gave his reasons why. As for trucks, he said, it would legislate them off the highways.



See America First — See America Now

EDITOR'S NOTE—This is the fifty-first of a series of illustrations and thumb-nail sketches of scenic and historic wonders of America to be published in Motor Age for the purpose of calling attention of motorists to the picturesque points of interest in their own country.

NO. 51—BRIDAL VEIL FALLS, MONT-EAGLE, TENN.

BRIDAL Veil falls, just a short distance from Monteagle, Tenn., while not being able to claim the volume of Niagara or the height of the Yosemite, have a charm which comes rather from a small volume of water falling down over successive steps chiseled out by nature, the action presenting a remarkable resemblance to the trailing veil, without which no bride's trousseau is complete. At the top of the falls the water begins its descent over a comparatively narrow ledge, but in its downward flow it spreads until, at the bottom, it covers a rather wide area. The rocky ledges cause the water to form a filmy spray, which, in the shadows cast by the dense trees and plant growth, only accentuates the likeness to that from which the falls derive their name. This waterfall is on the Dixie highway and is one of the attractions that will interest tourists on their way to the Southland over this new artery of travel which recently has been dedicated by a motorcade that covered the route from Chicago to Miami.

Photo copyrighted by Fred H. Abernathy

More Rational Speed Limits

WE need more rational speed limits in our cities and, for that matter, on country roads, if some of our courts are going to so interpret speed with relation to accidents. The supreme court of Tennessee has sentenced a motorist from 1 to 10 years for killing a minor that suddenly jerked himself from the hands of a guardian and ran direct in the path of a motor car. The court held that the motorist was traveling in excess of 20 miles per hour, the legal limit in the state, and that the violation of the law was a misdemeanor. The court held that the motorist violated the speed limit of the state and that such violation constituted negligence and that, "one that kills another in the act of committing such negligence is guilty of felonious homicide."

Although the motorist pleaded that the child suddenly ran in front of the moving car, the court held that the motorist must take the consequences of his unlawful act. The court continued, "One who disobeys the statutory rules as to speed is acting in defiance of the law and must be held to have anticipated the possibility of any injury caused by his recklessness."

Leaving the Tennessee case to itself, the fact remains that there are in many cities laws of 15 miles per hour which are violated every hour of the day and every day in the year. The motorist has left such laws alone on the assurance of the police that nobody will be bothered if not going over 22 miles per hour. This police assurance is good, but it appears quite valueless in the eyes of a supreme court that makes its rulings on the words of

the statute and not on the assurance of any policeman.

Motorists are daily courting grave possible danger by such ridiculous speed measures. The motorists should have more protection. If a speed of 15 miles per hour is being violated every hour of the day, that in itself is prima facie evidence that the limit is too low. It would engender a better spirit in all motorists if such absurd limits were removed and rational limits imposed. Put on a rational limit and then enforce it rigidly.

The report of the general manager of the Long Island railroad, printed below on this page, represents an extreme case, but it is worth consideration. We are going to have grade crossings with us for several years, perhaps for a century or more and, in the meantime, we should get the educational campaign working. Unfortunately it does not appear that any arrests were made for breaking down these safety barriers. It would be much more sensible to have such apparently careless motorists arrested and fined \$50, than to fine less offending drivers the same amount for exceeding the speed limit a few miles per hour on a deserted street. More rational legislation is needed. It would be a good example if arrests were made and severe fines meted out for such offenses as deliberately damaging traffic gates. Accidents can happen in such matters as this and if the crossing is so obscured that the approaching motorists cannot see the traffic barriers, there is still more reason for more adequate signals at perhaps 100 yards distance from the track.

Reckless Motoring

J. A. McCREA, general manager of the Long Island railroad, a railroad that is famous for the number of accidents each year at crossings, due to the thickly populated sections of the island and also the level nature of the ground, making elevated crossings very expensive, says that many motorists, motorcycle drivers and drivers of horse vehicles pay little or any attention to crossing signals and that it is purely good fortune that more accidents do not occur.

Mr. McCrea proves his statement by citing that during the month of October twenty-three different vehicles actually tried to cross the railroads when the traffic gates were down. Twelve vehicles drove into the traffic gates and broke them down, it not appearing whether these people saw the gates, whether their brakes failed to work, or whether the drivers were malicious in striking the gates. The list of twenty-three offenders is made of twelve motor cars, five motor trucks, five horse wagons and one motorcycle. In addition to so destroying the gates, there were several examples of signal posts broken down and lamp signals upset.

It hardly is possible to conceive of a more insane form of recklessness than the haphazard charging of safety gates at a guarded railroad grade crossing. Stop. Look and Listen is the watchword of safety.

Safety Semaphore

A SEMAPHORE SIGNAL invented by one of their own number is being tried out by Denver traffic officers at street intersections in the business district. It is of the "stop" and "go" type, is called the Ames Universal Guiding Street Semaphore and is the invention of Stark P. Ames, for several years a member of the traffic squad of the city.

A dozen of these semaphores are now being used on the most congested crossings, and four more are to be placed in a short time. The device is highly commended by Commissioner of Safety Nisbet, who expects it to be officially adopted by the city for the use of all traffic officers in the municipality.

The signal is easily turned by a handle and can be seen at ample distance. The "go" disk is white with black lettering, while the "stop" arms are red with white letters. When an officer leaves his post after the rush of traffic is over, the signal arms fold down alongside the standard in such a way that no warning is visible and the semaphore may be left standing without any confusion to travel.

The inventor has a plan for adding red and green signal lights for night use where conditions call for officers on traffic duty at night. This latter phase of the semaphore is one that will increase its usefulness to a great extent.





Resta Wins Century

Drives Peugeot at Average of 105.39 M. P. H.

Few Seconds Less Would Have Beaten World's Record

SHEEPSHEAD BAY SPEEDWAY, N. Y., Nov. 2—Special telegram—Crowning a season in which he has won two road races, one 500-mile speedway event, one 100-mile invitation dash and finished second in one other 500-mile derby, Dario Resta drove his Peugeot 100 miles here this afternoon in the unprecedented time for America of 56 minutes, 55.71 seconds, an average of 105.30 miles per hour, winning the first annual 100-mile race for the Harkness gold trophy. Bob Burman, also in a Peugeot, was close upon the Italian's heels, being but 1 minute, 58.24 seconds in the rear as Resta flashed over the tap and the checkered flag of victory flecked the hood of his mount.

Eddie Rickenbacher finished third in a Maxwell, while Ralph Mulford was given fourth money, although the latter failed to finish. Mulford was obliged to stop at the pits on account of tire trouble. There was some question as to whether he would get fourth money, but his showing seemed to entitle him to place, as both de Palma and Aitken were out of it.

Crowds Cheer Resta

Resta drove a sensational race and was given a rousing ovation from the 35,000 spectators. Mulford's driving was featured with thrills, but tire trouble robbed him of a chance for first money when he seemed to have an even opportunity.

Resta's average for the century of 105.39 miles per hour is only about $\frac{1}{2}$ mile per hour less than the speed Chassagne set at Brooklands.

Had Resta made the century 26 seconds faster he would have beaten the 100-mile mark on the famous Brooklands cement speedway in England, established some years ago. As it was, Resta was just 25.78 seconds behind the record, but had he been pushed in the latter part of the race, he undoubtedly would have brought to America the speed record of the civilized world for 100 miles.

Resta clipped almost 2 minutes off his

CONTESTANTS AT SHEEPSHEAD BAY
Reading from left to right—Ralph de Palma, Eddie Rickenbacher, Dario Resta, Ralph Mulford and Johnny Aitken. Below—Bob Burman

figure for the 100 miles in the matched race at Chicago earlier in the fall. He bettered the time for 100 miles on the Indianapolis speedway by over 10 minutes, an indication of the phenomenal progress made during the year in speedway racing.

Resta was one of a field of six starters made up of four Peugeots, a Mercedes and a Maxwell. The list was Resta, Aitken, Mulford and Burman in Peugeots, de Palma in a Mercedes and Rickenbacher in a Maxwell.

Burman finished second, being over a lap back of Resta, but making the century in 58:38.95, an average of 102.43. Third place went to the only American car, the Maxwell, driven by Rickenbacher in 61:00.59, or 98.33 miles per hour. Only three cars finished, Aitken going out when in the lead at 12 miles with a broken connecting rod; de Palma going out at 40 miles after having made two stops for carbureter and being two laps behind the leader, and Mulford going out at 92 miles, when in second place, with a broken connecting rod. Mulford drove the spectacular race of the day, making four stops to change right rear tires and then running barely a lap back of Resta, who did not make a single stop in the 100 miles.

The drivers circled the track for a preliminary lap, taking a flying start at 3:22 p. m. As they got away, Rickenbacher was about half a car length in the lead, though at the end of the first lap Aitken forged to the front, taking the tape about 30 feet ahead of the field. Resta was second and Mulford third.

At the start, Aitken took the lead and at 10 miles set a pace of 102.62 miles per hour. At 20 miles, Mulford was leading Resta by 6 seconds, Aitken having been eliminated. Mulford's average at 20 miles was 105.18 miles per hour. At 25 miles, Mulford still led, average 106 miles per

At Sheepshead Bay

Burman Trails Italian by 1 Minute 58.24 Seconds

Rickenbacher Finishes Third, Mulford Fourth—Six in Field

hour, but at 28 miles he made his first tire stop. It was at 30 miles that Resta got the lead with an average of 105.36 miles per hour, and from that time to the finish he was never headed. His pace averaged slightly over 105 miles per hour at each 10-mile period up to the 100 miles. In the meantime, Burman and Mulford and de Palma were changing places, due to the stops. De Palma stopped for carbureter troubles at 24 miles and at 26 miles Burman changed a right rear, making the change in 24 seconds. At 28 miles Mulford made his first stop to change a right rear tire. This put all three a lap back of Resta and they were never able to gain it. Lap after lap, Mulford ran 5 to 6 seconds faster than Resta and soon gained a mile he had lost, but soon more tire trouble overtook him. He had four tire changes before he went out at 92 miles. A second stop for carbureter troubles put de Palma over two laps back. Rickenbacher, like Resta, made the 100 miles without a stop, but his speed was not great enough.

De Palma Drives Sunbeam 113.85 M.P.H.

The other event of the day for the 35,000 spectators was two heats of a matched race between de Palma in the twelve-cylinder Sunbeam, now owned by the Packard company, and Burman in the Blitzen Benz. De Palma won both heats, the first at 4 miles and the second at 6 miles. The 4-mile heat was run in 2:08.61, average 111.97 miles per hour, and the 6-mile heat in 3:09.65, or 113.85 miles per hour. There was not a length separating the two cars at the finish in each heat. Jesse G. Vincent drove a Packard twin six 2 miles in 1:10.52, averaging 102.25. It had special valve timing and higher compression than the stock job and used a double Zenith carbureter.

In the 100-mile race all cars used Zenith carbureters, Bosch magnetos, Silvertown cord tires and wire wheels. Resta used K L G plugs.

Fender Fraud Charged

Bribery Suggested in So-Called Safety Tests

Association Official Target at Judicial Committee Hearing

CHICAGO, Nov. 2—Suggestions of bribery and fraud in the conduct of fender tests for the city of Chicago may result in throwing considerable light on the conduct of the so-called tests of safety fenders, which have been going on in Chicago. H. L. Eisenhower, president of the Telescopic Fender Co., made charges before the judiciary committee of the city council yesterday, which involved Emanuel Freidlander, president of the Fender Manufacturers' Association. It is expected that these will result in an airing of the conditions in the fender tests, as information it is understood is to be placed in the hands of the state's attorney.

Eisenhower's attorney paved the way for the disclosures by making insinuations regarding the good faith of the committee which has been testing truck fenders under the direction of the deputy superintendent of police. The tests were made for the purpose of recommending to Chief Healey which fender should be approved by the police department, as complying with the fender ordinance passed nearly a year ago.

Tells of Money Paid

Eisenhower said that he paid \$300 to Freidlander, the first \$100 of which was to be paid over to the city to meet the cost of the test. In accordance with Freidlander's statement all the business is being done between the fender association and the testing committee. Eisenhower said that Freidlander gave him a receipt and a written guarantee that he would get a certificate of approval of the fender or receive his money back. The second \$100, according to Eisenhower, was to assure the passage of the fender, and the third \$100 was paid on the representation that the association needed the money and that "everything was fixed."

It seems that the telescopic fender has not been approved as yet, hence the disclosures. The deputy superintendent of police, in charge of the tests, claims that the Eisenhower payment of the second \$200 was for the purpose of bribing one of the committee, but it was unsuccessful.

The Standard Fender Co., a member of the association, is the only concern thus far which has received the approval of the committee. The chief of police, however, has not issued a certificate to the Standard company and the latter is complaining because the certificate is held up. The Standard Fender Co. is represented by Attorney Frank L. Childs, who, by the way, is the attorney for the Chicago Motor Club. The chief of police has withheld

the issuance of the certificate to avoid creating anything like monopoly, because only one fender thus far has been approved. It is stated that three or four other fenders may be approved soon.

INVESTIGATE CAR APRON MEASURE

Canton, O., Oct. 30—Fearing danger of explosions, safety department officials are making a careful investigation of the proposal to compel car owners to equip their cars with aprons to prevent oil dripping on city pavements.

Motor car men have told city officials that aprons not only collect oil and grease but gasoline dripping from carbureters and that if much gasoline collects in the apron an explosion might follow when a spark is dropped into the collection pan.

A city ordinance directs that cars be equipped with aprons to stop oil drippage on the streets, but the safety department officials are not yet certain whether to enforce the law in this respect, or ask council to make a change in the ordinance.

ROTHSCHILD LEAVES LOZIER

Detroit, Mich., Nov. 1—Maurice Rothschild, vice-president of the Lozier Motor Co., has resigned and disposed of all his interests in the company to Theodore Friedeberg, New York, and to Samuel and Harry Frank, Detroit. These gentlemen now own all of the stock in the Lozier Motor Co., as Charles Shongood, also a vice-president of the company, is out of the concern, his stock having been bought by the same men.

Mr. Rothschild voluntarily gave up his interests in the company and took the initiative by offering to sell. He believed it for the best interests of the business. His connection with the Harris Bros. Co., which also is known as the Chicago House Wrecking Co., had created a belief that the Lozier company would liquidate its holdings and retire from business.

Theodore Friedeberg is president, Samuel Frank, secretary and general manager, and Harry Frank, treasurer, of the company. An early announcement of a large increase of capital portends activities of an interesting nature within the near future. The present Lozier company has a plant comprising 61 acres, and assets amounting to \$4,000,000.

LYNITE PISTONS DIE-CAST

St. Louis, Mo., Oct. 29—A new wrinkle in motor car parts—an aluminum piston die-cast by a patented process—will be put on the market December 1, it was announced here this week by the maker, the McQuay-Norris Mfg. Co., also maker of Leak-Proof piston rings. The new product will be called Lynite pistons.

A special campaign will be waged by the company to place the Lynite pistons and Leak-Proof piston rings on Ford cars. A set of four Lynite pistons with this company's rings will sell for \$30.

Western Gas Price Up

Four-Cent Increase in General Since March

Estimated That Standard Has Made \$90,000,000 Out of Fight

NEW YORK, Oct. 29—Gasoline prices continue to rise throughout the west, the latest advance being that in Cleveland where Standard Oil has raised its price per gallon 1½ cents, or 14 cents to garages. The independents have met the increase by an advance of 1 cent a gallon or 14 cents. White Rose brand gasoline of the National Refining now is quoted at 16½ cents a gallon, an advance of 3 cents. The price of retail trade is 1 cent higher than these quotations. In March the garage price was 11 cents, and there was no change in price until September 9.

The average increase throughout the country has been about 4 cents a gallon since March. In the last 6 weeks gasoline prices in various cities have been advanced two or three times. This week there has been an increase in price from 1 to 3 cents a gallon in the principal cities of the country, including Portland, Los Angeles, Seattle, Minneapolis, San Francisco, Detroit, Kansas City, St. Louis, Chicago, Louisville, Denver and Cleveland. The oil experts attribute the advance to the increase in cars, the general increase in demand for gasoline, and the fact that production has not been increased.

The Standard Oil Co. of Indiana last week increased the price of gasoline in St. Louis 1 cent, making it 13 cents to consumers and 11.9 cents to tank owners. This follows the advance in Chicago from 11½ cents and 12½ cents.

St. Louis jobbers estimate that the fight between the Standard Oil Co. of Indiana and the independents, which began last May, has netted the Standard Oil nearly \$90,000,000. About half of this represents the increase in the price of crude oil, of which the company bought nearly 67,000,000 barrels, which oil is still in the company's tanks. The other half has been made by buying all gasoline from the independent refiners in the Cushing oil field.

Gasoline prices in Cincinnati have been advanced 3 cents a gallon, now being 15 cents, and further advance is looked for. This price is for tank wagons. To wholesalers the price is 14 cents, although to wholesalers deliveries are being made at lower prices. The price in March for tank wagons was 12 cents and the wholesale price was 11 cents.

The Continental Oil Co. and the Midwest Refining Co. in Denver have advanced the price 1 cent, or 17 cents a gallon to tank wagons and 16 cents to garages.

Louisville gasoline now quotes at 13½ cents a gallon on tank wagons, compared with 11 cents at the end of last March.

Eight-Cylinder Engines vs. Twin Sixes Before Hoosier S. A. E.

Crawford of Cole Presents Octuple Side of Multiple Motor Argument to Indiana Section

INDIANAPOLIS, Ind., Oct. 30—The eight-cylinder side of the eight versus twelve argument was presented last night to the members of the Indiana section of the Society of Automobile Engineers and the visiting engineers at the meeting of the section at the Claypool hotel last night. Charles S. Crawford, Chief Engineer Cole Motor Car Co., took up the cudgels in behalf of the eight-cylinder engine in reply to the arguments for the twin-six presented by Jesse G. Vincent, vice-president of engineering, Packard Motor Car Co., to the Detroit section September 16, and to the Indiana section September 24.

Prospects of an interesting and illuminating argument on multiple-cylinder engines together with the afternoon feature of acceleration and speed tests of eights and twelves on the speedway and a view of the Peugeot driven October 9 at Sheepshead Bay, which was dissembled for the purpose brought out a large representative gathering. Every motor car manufacturing center was represented by engineers from some of the factories. Chairman Moskovics and Secretary Combs had done such good publicity work that there were in the neighborhood of 300 engineers in attendance.

Acceleration Formula Wanted

Before taking up Crawford's paper, the suggestion was made by Guy Wall, of the National company, that the section appoint a committee to develop a standard method for conducting acceleration tests. He stated that there were other factors than the actual time element required to increase speed from one definite point to another to be taken into consideration and cited that it was possible to cut down the flywheel weight and get very good acceleration, but the lower flywheel weight would give poor idling. He suggested that the section get up a formula which would take in such factors as wheel sizes, gear ratios, and so on, that what the owner wanted was low-speed ability as well as rapid acceleration.

In confirming this, Howard Marmon, of Nordyke & Marmon, stated that the owner availed himself most of the car's ability to get from one speed to another and there was needed a standard definite way to compare cars on that basis.

The matter was referred to the Research committee of the section for report next meeting.

The new section of the S. A. E., the Mid West section, organized recently in Chicago, was introduced to the Hoosier section by Darwin S. Hatch, of Motor Age, who outlined the purposes of the new section and stated that it would not encroach upon the territory of the Indiana branch.

The Research committee of the Indiana

section then presented report of test made that afternoon for acceleration and speed of a Cole eight. With an eight-cylinder motor $3\frac{1}{2}$ and $4\frac{1}{2}$, stock Cole eight car except for cord tires, the acceleration on the speedway on high gear from 10 to 50 miles per hour was made in $21\frac{1}{2}$ seconds. This was the average of two readings, one taken in one direction and one in the other. The speed test conducted in the same manner gave 64 miles per hour. These tests were made with the windshield in operation and the top up.

With the top lowered and windshield open the Cole eight made an average of 23.7 seconds in accelerating from 10 to 50 miles per hour. The speed in this instance

was the same as that of the previous one. The car was geared 4 to 1, had 34-inch diameter wheels, used aluminum alloy pistons with clearance of .005. These are all stock specifications. However castor oil was used as a lubricant. With the same carbureter adjustments the car gave an average of $2\frac{1}{2}$ miles per hour on high in the low-speed test. This was done with one bad cylinder caused by a piston which had seized the day before.

Crawford's paper was read by Haynan, of the Cole Motor Car Co., and was entitled, "The Characteristics of the Eight-Cylinder Engine." Some of the pertinent points brought out by Crawford were as follows:

The Characteristics of the Eight-Cylinder Engine

By CHARLES S. CRAWFORD
Chief Engineer, Cole Motor Car Co.

IN the outset permit me to call your attention to this fact:

The eight-cylinder engine should not be regarded as a so-called "Twin." It is a well-rounded mechanism of eight co-ordinating cylinders possessing characteristics different from those of any other type of engine that has preceded it.

In discussing the eight I have taken three things into account: First, that the principle of the eight-cylinder V-type engine, as it is now applied, is sound from an engineering standpoint. Second, that it represents a standard of commercial value attained by no other type. Third, that it is a product which, as the best proof of its practicability, during its first year of active and continuous service, has won for itself a place in the forefront of the industry by sheer performance.

Little more than a year has elapsed since this type of motor was first produced commercially in this country for automobile use, but while much has been done in the matter of research on this particular type of engine, equally aggressive steps have been taken in the production of other combinations and numbers of cylinders.

The appearance of the multiple cylinder engines may be attributed to several things: First, to the general tendency to high-speed, high-efficiency engines with limited capacity of individual cylinders, the dimensions of which are confined within the limits to which it is possible to obtain a maximum efficiency from one cylinder of given displacement. Second, the need for smoother running engines for the larger types of cars. Third, a means of giving to the purchaser better car performance at a lesser cost, by the opportunity the Eight's construction offers to reduce the manufacturing cost. Last, the advantages the construction affords to realize certain ideals which with other types of engines we were unable to attain.

Each type of engine has its own characteristics, standard of efficiency and measure of ability to do certain things; each, a relation between this said ability, the relative complications (or shall we say simplicity) and cost per degree of merit.

It is generally recognized that the useful cylinder bores vary between 3 inches and 3½ inches, while the stroke may vary between the ratio of $1\frac{1}{4}$ to $1\frac{1}{2}$ to one. In support of this contention we refer to the performances of European engines where there are respectively examples of the smallest and largest bores, each with the same piston displacement and with a correspondingly large and small stroke-bore ratio, yet both engines giving equally satisfactory performance.

The attainment of the ideal engine for the required displacement must have a maximum available torque; a frequency of impulse sufficient to render the engine smooth (the torque frequency being that applied to the road wheels), and a speed range that covers these desirabilities without excess, consistent with the standard of merit, as we have chosen to designate the relative value.

Now the eight, as we have it, answers all of these requirements, and, as a commercial product, compared with its nearest neighbor—the six, of equal piston displacement—has the advantage in initial cost—a greater degree of merit in this respect to begin with.

From the standpoint of simplicity, it achieves a standard that places it ahead of other multiple-cylinder types.

From the point of durability, the eight is better because of the superior rigidity which it possesses, and this is conducive to longer life. I might point out here that the internal rigidity, as found in the eight, is a most essential factor. And remember that the considerations of rigidity are quite distinct from those of actual strength.

The compactness of the eight-cylinder engine is greater by far than that of the six. It occupies much less space in a chassis of given length. This affords a great deal more room for the body. It can be made large and commodious without excessive overhanging, which is bound to handicap the performance of the car.

The fundamental requirements to attain the desired "range of ability, smoothness and minimum noise" can now be determined. These, as you know, were defined as the essentials of the ultimate motor car.

"Range of Ability"

The required range of ability, which in substance means the capacity of the engine to do the ordinary thing and to answer everyday requirements, is that which can be utilized in practice, and a speed range that will give a car from 2 to 60 miles an hour in high gear is, as we all know, ample.

The desirable torque must be maintained throughout the useful speed range, and this the eight-cylinder engine does.

This range of capacity depends upon the ability to run the engine to reasonably high speed without detrimental vibration and to arrange the gear ratio in relation to the highest speed that can be developed with a maintenance of torque.

To illustrate this: If an engine running at 2,600 r.p.m. can, with a given gear ratio, make a car go 60 miles per hour, then the necessary size or displacement of the engine can be determined by the torque necessary to reach this speed in a given time, or with a given acceleration, say, of from 10 to 50 m.p.h. in a certain number of seconds.

Fundamentally, the torque developed is dependent on the displacement and the mean effective pressure on the pistons. Given a full charge in the cylinders by volume, this pressure is proportional to the energy of the mixture.

To illustrate this point more clearly: There is a certain mixture of gasoline and air which, with normal quality of gasoline, is about one to fourteen. This is the most efficient from the point of perfect combustion, which means that the energy which we derive from it on its combustion is a maximum consistent with the heat energy in the fuel.

It is possible to increase the explosive pressure by an increase in the strength of the mixture, that is, an increase in the heat energy of the mixture, and this can only be accomplished by having the maximum weight of gasoline and air.

We might have the best of volumetric efficiency from a valve-timing viewpoint and yet the heat energy of the charge would not be a maximum if it were of too high a temperature or partially expanded before entering the cylinder.

Excess compression of the charge in the cylinders does not add to the pressure. We still have the same quantity of heat units in the mixture and by excessive compression we do not increase these. More work is done on the compression stroke, and though the initial pressure is higher there is no net gain in work on the crankshaft.

Thus it follows that the chief advantage of increasing the compression is to obtain rapidity of ignition at high speed and not to increase the torque at low speed. With an eight-cylinder engine, properly designed, we secure every advantage necessary for practical purposes, therefore, without incurring the danger of trouble plus by going beyond that point. *The torque developed in an eight should be and is greater than that of a twin-six with the same displacement, for there is a greater heat loss with an increased number of cylinders.*

The area of cylinder wall exposed is proportionately greater, the displacement being the same, and when it is considered that approximately 60 per cent of the heat energy of the fuel is lost through the cooling water and radiation, the fallacy of too great a number of cylinders with a consequent decrease in individual cylinder displacement becomes evident, while the presumption that, by reason of the small bore and increased compression it is possible to increase the available torque, also, is shown to be fallacious.

Engines with small bore and necessarily high compression, while being advantageous at the very high speeds, invariably give unsatisfactory operation at lower speeds, and it is always necessary to retard the spark in order to prevent knocking. It follows, necessarily, therefore, that the eight, with its larger bore and consequently lower compression, is bound to possess advantages in this respect and must of necessity give a smoother operation at the lower speeds.

"Smoothness"

Defined, smoothness is the mode of application of the torque or the minimum angular variation in turning effort on the crankshaft, which is a function of the impulse frequently and the means adopted to store the torsional energy and eliminate the fluctuations.

So much for the engine smoothness of the torque applied. Now consider the frequency of impulse at the road wheels and it will be seen that this will depend on the gear ratio, as with an increase in gear ratio and likewise increase in engine speed, there will be a proportional increase in frequency at the road wheels. This is as important from the standpoint of smooth running as is the engine frequency.

Acceleration and Torque

As we have defined the desirable range, we can assume that with the engine running at 2,565 r.p.m., in order to get a road speed of 60 miles per hour with 35-inch wheels, eliminating slippage, a gear ratio of 45/11 is required. From this basis, establishing a definite acceleration, the necessary displacement of the engine to get the torque essential, can be determined.

In the light of the performance of powerful multiple-cylinder cars, the acceleration of from 10 to 50 miles per hour should be accomplished in from 20 to 25 seconds.

Cole eight stock jobs will run in, carrying three passengers and with windshield and top up, will give an acceleration of from 10 to 50 miles per hour in from 22 to 24 seconds. The motor has a piston displacement of 346 cubic inches, giving a maximum torque of 187½ foot-pounds.

The horsepower and torque curve of this engine is shown in Fig. 1, while in Fig. 2 is shown the torque developed per cubic inch of piston displacement. Incidentally, the torque developed per cubic inch of piston displacement of a twin-six engine is also shown in Fig. 2.

In this figure A represents the curve of the eight-cylinder engine, while B designates that of the twin-six under similar conditions. The torque in the eight is conventional, inasmuch as the most efficient speed is in the neighborhood of 1,000 r. p. m., which corresponds to 750 feet per minute piston speed.

The efficiency of the carburetor, by reason of constant jet suction, is logical in the eight, while the suction strokes if closer together, as in the twin-six, produce an excessive lap which creates at some point almost double suction in the manifold.

In regard to frequency of impulse it is asserted that the frequency is proportional to the number of cylinders. The actual frequency at the road wheels is the determining factor, however, and this is dependent on the gear ratio.

"Minimum Noise"

By the term "minimum noise" we mean the ability of the mechanism to operate without objectionable sound. Previously we have dealt with the vibration and the noise resulting therefrom, and under this heading we will consider the noise resulting from the parts of the mechanism which come together with metallic contact due to the clearances that must naturally exist.

Since in any engine the clearances are practically the same, the noise therefrom will be substantially the same per contact. Thus, the multiplication of the parts in operation will increase the noise in the same proportion as such multiplication occurs.

Let us for a moment consider push-rod clearance. It is necessary in any type engine to have definite clearances to provide for expansion of the valves. While the weight of the push rods may vary slightly in the case of large and small bore engines, the impact caused by the acceleration of the push rods will be substantially the same and will depend upon the angle through which the camshaft moves in taking up the clearance—in other words, the back lash angle.

If the minimum specified clearance is not maintained, the noise produced is increased to a marked degree. Under these conditions the total sound made by the conglomeration of the small noises is accentuated in proportion to the multiplicity of parts. These conclusions bring forcibly into prominence the relative merits of the eight and twin-six power plants interpreted in terms of their relative simplicity and proportionate quietness.

In a recent criticism of the eight it was assumed that the accessories must, of necessity, be placed in a so-called conventional position and because the particular construction of the eight did not permit with advantage the placing of the accessories in that position, it was considered distinctly disadvantageous.

In the general layout of the Cole V-type

engine, though the position of the accessories is not what is purported to be the conventional one, *distinct advantages are to be gained from the positions in which these accessories are placed.* The position of the water-pump is ideal for it simplifies to a considerable degree the water-piping in distributing the water to each block.

Turning Radius

The taper of the hood is determined by the body width at the dash and the width of the radiator. Therefore the frame width is no greater than would be necessary with any other type of engine and the turning radius is, therefore, just as small, consistent with a 126-inch wheelbase, as would be possible with any other type of engine. The steering gear, too, offers no trouble and is equally as accessible in the eight as in the six or twin-six. *As a matter of fact, the location and assembly is identical to that found in our previous models, and they were located in the chassis, according to the present standard practice.*

In the light of all we have shown, therefore, we are brought necessarily to these conclusions, viewing the situation from the most advanced standpoint:

The eight-cylinder engine, by its inherent virtues, offers wider and more logical commercial possibilities.

It affords greater structural economy. It has the necessary ability and flexibility. It possesses a higher degree of thermal efficiency, greater durability and superior simplicity.

And it combines all of these with a factor that means more, perhaps, from a competitive commercial standpoint than most any other—*minimum maintenance cost.*

Exactly in proportion to the addition of cylinders do we increase the maintenance cost of an engine. For that reason the eight is bound to establish a standard of efficiency in this respect that has not been attained with an engine of more cylinders.

Summing it all up, but one final determination is reached—the eight, with its small per cent of increase in the number of parts, brings with it a greater proportionate increase in adaptability and performance, while in the twin-six, as we have seen it, a further increase in the number of cylinders, adding only slight advantages in one respect, brings disadvantages in the other that considerably outweigh them.

In the discussion of the paper Guy Wall, of the National Co., referred to Crawford's statement, "Since in any engine the clearances are practically the same, the noise therefrom would be substantially the same per contact, the multiplication of the parts in operation will increase the noise in the same proportion as such multiplication occurs." Mr. Wall stated that if we multiply the parts of the same size and shape this would be true, but if they are not the same size and weight, it would not be true.

Tack Hammer vs. Sledge

He illustrated this with the suggestion of a boiler shop in which a sledge was being operated slowly with a heavy blow—this

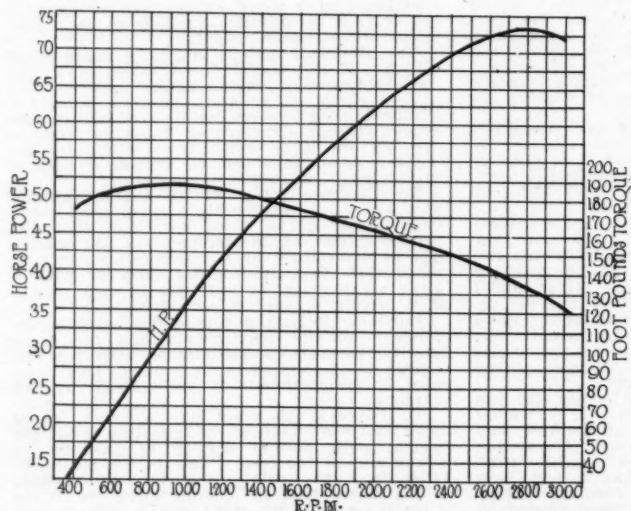


Fig. 1—Torque and horsepower curves of eight-cylinder engine

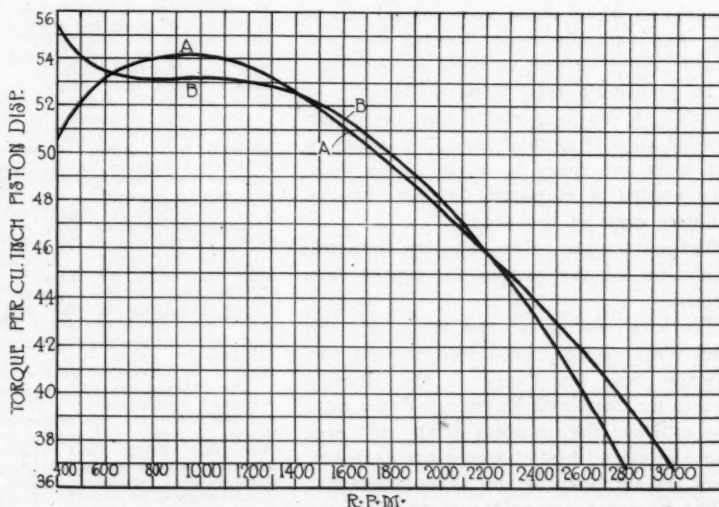


Fig. 2—Unit torque of A an eight, and B a twelve

representing the small number of parts, and compared it with very rapid blows from a tack hammer, leaving it to be inferred that the rapid blows from a tack hammer would be less objectionable than the less frequent and louder ones from the sledge. He thought Crawford was right as to the heat loss being less in the eight than in the twelve on account of the area, but the loss in the single-cylinder engine is still less and there are things which compensate for this loss in the greater number of cylinders. One is able to keep the pistons cooler and to use smaller clearances with the small-bore motor and higher compression.

Mr. Dorris, of the Dorris Motor Car Co., stated that it was his belief that the engineers in this discussion were overlooking the buyer of the car. He thought they ought to glance over their repair shop list; that there were other items beside cylinders that were giving trouble.

Mr. Loomis, of the Packard company, who, to an extent, represented the absent Vincent, stated that the question of evenness of torque resolved into the number of impulses per unit of distance traveled, which would give Packard 1,375 as against 1,030 for Cole or $\frac{1}{3}$ more impulses with stock gear ratios. In regard to the complication of water piping, he stated that this was the same on the twin-six as on the old Packard six. In considering the variation in volumetric efficiency, he stated that the Packard used this argument many years ago when building "one-lungers," in prophesying that the two cylinder never would replace the single cylinder.

Accessibility of Steering Gear

As to the accessibility of the steering gear, he stated that the Packard frame width was much less than that of the Cole, and contended there must be more difficulty in placing a steering gear with a 90-degree motor than there is with a 60-degree one.

Alanson P. Brush, consulting engineer, gave it as his belief that the twelves and the eights were equally good if kept in the best range of their adaptability; that for any speed range there is a critical cylinder diameter which will give best results, and that this factor is the one that should determine the number of cylinders. He believes that this critical diameter ordinarily is less than the $3\frac{1}{2}$ inches mentioned.

In discussing the noise question, he developed the fact that if an engine be multiplied, all of its parts, exactly in proportion, that tappet impact decreases as the number of cylinders is increased. He repeated the statement that quietness is continuity of noise and that the impact is lighter on a twelve as the tappets are lighter and the energy of the blow is very much less. For the same power the smaller valve parts of the eight and still smaller ones of the twelve should make upkeep actually less than for motors of smaller

number of motors if equally designed and made.

Mr. Heinze, of the Heinze Electric Co., and formerly designer of the Northway engines, corroborated Brush's statement that there was a certain size of bore and stroke which gave highest thermal efficiency, but disagreed with Brush when he said that he thought this was greatest in a cylinder $4\frac{1}{4}$ by $5\frac{1}{4}$. This fact, however, he did not consider the most important consideration for the buyer, who is buying for the smoother running qualities of the eight and twelve. The smaller number of cylinders would give fewer parts but durability is more to be desired. Heinze opened up a wide field when he asked "When will some one come along with a sixteen?"

When the Sixteen?

The more cylinders the less noise, he said, and engineers whether they knew it or not throughout the entire industry were striving towards the gas turbine. He thinks the limit is not reached in the twelve cylinder.

Mr. Bull, of the Cole engineering staff, stated the Cole frame width was the S. A. E. standard width and there should be no objection to a width already standardized.

The afternoon session at the speedway proved an interesting one as twelves, eights and sixes were given tryouts for speed and acceleration and low-speed running. National twelves, Cole eights, and Marmon and Dorris sixes and Haynes were put through their paces for the visiting engineers. After that they were taken to the Prest-O-Lite plant where the Peugeot racing car was torn down for their edification, as one of the best examples of motor car engineering.

APPERSON PRODUCTION ENLARGED

Kokomo, Ind., Nov. 1—The total acreage of the Apperson plants is to be increased until the working space aggregates over 1,000,000 square feet, and production is to be increased to 10,000 cars a year, according to an announcement issued by the Apperson Bros. Automobile Co. The added floor space will total over 500,000 square feet. Work is already under way on two new buildings, which are being constructed at the location of Apperson plant No. 2. These buildings alone will afford an additional space of 150,000 square feet.

MAXWELL FUND FOR DEALERS

Detroit, Mich., Nov. 1—Special telegram—Arrangements will be made by the Maxwell Motor Co., to provide funds for the benefit of its dealers to enable them to pay cash for cars they order in December, January and February, which are the months when sales are generally very slow. The Maxwell company will use part of its surplus for this, making deposits with certain banks, with the understanding that the dealer will have credit to the

amount of the deposit made with the bank. The dealer is to provide one-fourth of the purchase price from his own resources, the balance being made up of the deposit or loan. Thus he will be able to pay cash for the cars. Certificates of deposit to bear 3 percent interest will be accepted by the company, and they in turn will be negotiable through special arrangement with banks.

PHILADELPHIANS IN FLETCHER RUN

Philadelphia, Pa., Oct. 30—Ten cars took part in the thirteenth annual run of the Automobile Club of Philadelphia for the Fletcher Cup today. Le Mar Talbott, driving a Pierce-Arrow, secured a leg on the trophy by finishing with the lowest penalty, 3.48 points. The time of each contestant was recorded at secret controls placed at various places along the route, which was to several nearby suburbs, with a stop for luncheon at Fairview, Pa. Penalties of a point were imposed for every minute ahead or behind scheduled time at the controls. P. D. Folwell acted as starter.

CHANDLER CENTERS \$10,000,000 DEAL

Cleveland, O., Nov. 2—Announcement was made yesterday that strong eastern interests have entered the Chandler Motor Car Co., that the company's facilities will be greatly increased and that it will become a \$10,000,000 concern. Control will remain where it has been since the company was organized 3 years ago, and the Chandler officials will continue in charge.

MOTOR SHOW IN DALLAS FAIR

Dallas, Tex., Oct. 29—With \$1,000,000 worth of cars on display, the third annual motor car show by the Dallas Automobile Dealers' Association is on in Dallas. It opened with the Texas State Fair October 16 and will be concluded Sunday, October 31. During the first 9 days of the show, more than 200,000 visitors, many of them farmers, passed through the exhibit building. Of this great mass of visitors it is believed that at least 50,000 stopped and asked questions regarding the merits of the various cars. This 200,000 attendance, however, represents only about one-fifth of the attendance at the fair.

Under the leadership of J. W. Atwood, president of the Dallas Automobile Dealers and Accessories Association, and Buick representative, thirty exhibitors occupied every foot of space. Had the building been larger, the space could have been profitably used as several were compelled to seek space in adjacent building.

TRANSCONTINENTAL RUN ON HIGH

Indianapolis, Ind., Oct. 29—The Pathfinder Co. is planning a high-gear transcontinental trip of Pathfinder the Great, the new twelve. Only two speeds will be provided, high and reverse, and the run will start in the spring.

Stock Motors Are Very Much Improved for 1916

Past Year Has Seen Most Rapid Development of Engine Design in History—New Types Are More Efficient and Easier to Keep in Good Condition

FOR many years the European cars have been supposed to have the most advanced engines, the smoothest operating and the most efficient powerplants. With the coming of war and stagnation of the European motor car industry, America seems to have seized upon the opportunity to get ahead, and now she leads all along the line.

What has 1915 had to show?

Firstly, the eight and the twelve, which possess qualities never attained by any European motors.

Secondly, high efficiency sixes and fours at prices far below anything ever before attempted in any part of the world.

Third and last, but by no means least, an American-designed, American-made and American-used motor; the product of a stock motor builder, beating the pick of the world's special motors on the speedway.

That in brief is the record of the American stock motors for 1916, and it is a record to be proud of.

Simplicity and Progress

The characteristic motor of 1916, if we except the eights, is the light six. Nearly all the motor manufacturers have a six of dimensions near to 3 by 5 inches and these are almost all designs which possess the greatest possible simplicity. Quite a number have detachable cylinder heads, towards which the year has shown a very marked trend, and it is a trend for which the owner has reasons to be thankful.

Every motor comes, sooner or later, to the time when the carbon must be scraped out, when the valves must be ground in and everything looked over. With a block-cast six it becomes an easy job for the intelligent owner, as long as the cylinders have a detachable head, for by removing this the combustion spaces are laid bare, the valves are all exposed at once, and the task of valve grinding is made the easiest possible. It is but seldom that there is need to remove the pistons from the cylinders, which is the operation that a man cannot perform single-handed with any block-cast six that has not a loose head.

Minimum Lubrication Piping

Then too, take lubrication. The up-to-date engines have a minimum of piping, there are few oil leads outside the crankcase, which means that they are easier to keep in shape as there are fewer joints with a possibility of leakage. Not infrequently the cylinders and the upper part of the crankcase are in one piece, and then the whole engine becomes a unit with hardly an attached part. To do the periodical clean-out of the oiling system that is necessary there are no pipes to uncouple, all one needs do is to pour kerosene in the crankcase, run the engine on the starting motor for a couple of minutes, and drain off the dirty fluid before refilling with clean oil. In the days of small and intricate piping this was hardly enough; today it is ample and it means that half an

hour will do what once took half a day.

The smaller dimensions and the greater rigidity of 1916 stock motors has produced quieter engines, and engines with less vibration. The average light six to be found in inexpensive cars is a wonderful combination of docility with power. The small, light pistons cut the vibratory forces in two; the ability to run at 2,000 revolutions per minute, or over, enables high speed to be had in combination with good pulling power at low speeds and withal the smaller motor uses less gasoline and less oil and is easier on tires.

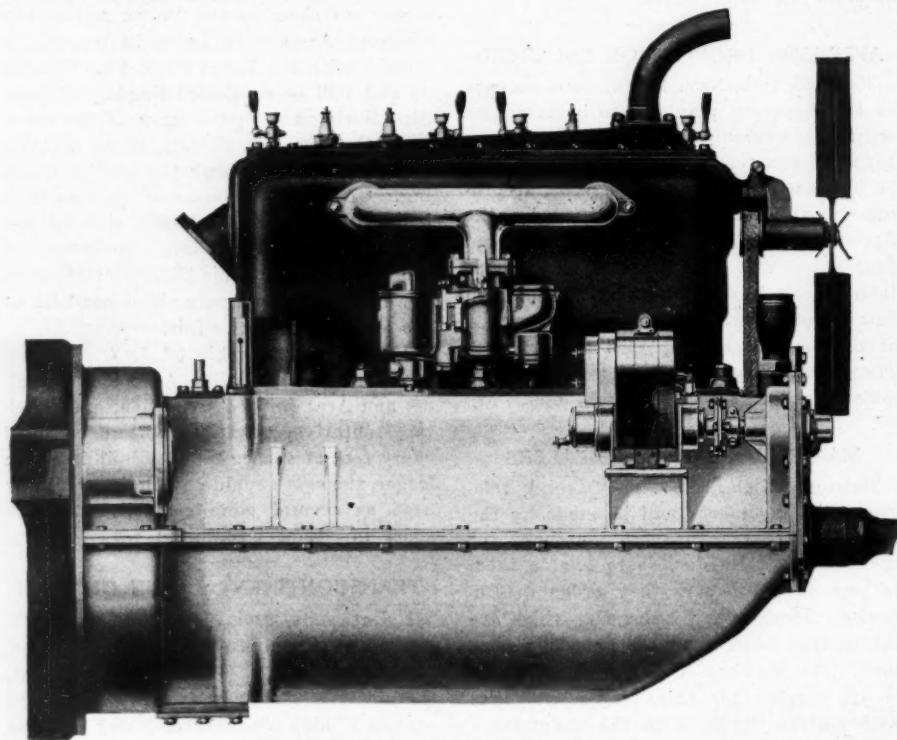
Quietness is gained by smaller valves with lighter springs. Simplified layout has done away with a gear or two at the front end and so destroyed a few extra chances for noise production. We are still a good long way from real silence which means absolute noiselessness, but we have substituted a pleasing hum for an unseemly roar. The smaller individual explosions of the smaller cylinders purr at low speeds instead of coughing.

A conspicuous feature of the modern motor is that it has become almost as integral a part of the chassis as the frame. It is seldom necessary to remove the motor in order to take up bearings or do any other work, with the detachable-head type particularly, which highly desirable feature arises from the use of a smaller number of parts and a better accessibility for those parts which do require removal occasionally.

Aluminum a Feature

Perhaps from the vista of the years to come, the most striking development of 1916 will prove to be the coming into general use of the aluminum piston and the entry into the field of aluminum cylinders. The latter are not yet used habitually by makers of stock motors, owing to the present phenomenal price of aluminum, but that the aluminum cylinder, with its advantages of light weight and splendid cooling, is an accepted truth is largely owing to one of our stock motor manufacturers who sent out some thirty motors of this sort early in the year without advising the customers to whom they went. This was the ideal and proper way of trying out a new idea and has given positive proof, but, more than this, it is a proof of the engineering activity of stock motor manufacturers.

Aluminum pistons are the secret of quiet, vibrationless running on several stock engines and assist the owner in another way by reducing the internal forces in the engine and so increasing the durability of bearings. It has taken stock motor quantity production to put these pistons to the test and thus, again, the



New type TU four-cylinder Wisconsin motor

builders are to be thanked for proving a real advancement in the scientific field of motor engineering.

In the lubrication field, pressure systems are gaining vogue, and the splash systems are growing more accurate. The commonest system still is that in which the connecting rods dip into troughs which are kept filled with oil by a pump, and sometimes the splash so created cares for every bearing, while in other cases the main bearings on the crankshaft have direct feeds from the pump. Usually the latter system is considered the better and is backed by many celebrated manufacturers.

Then, too, we have the pressure system in which oil is sent from the pump direct

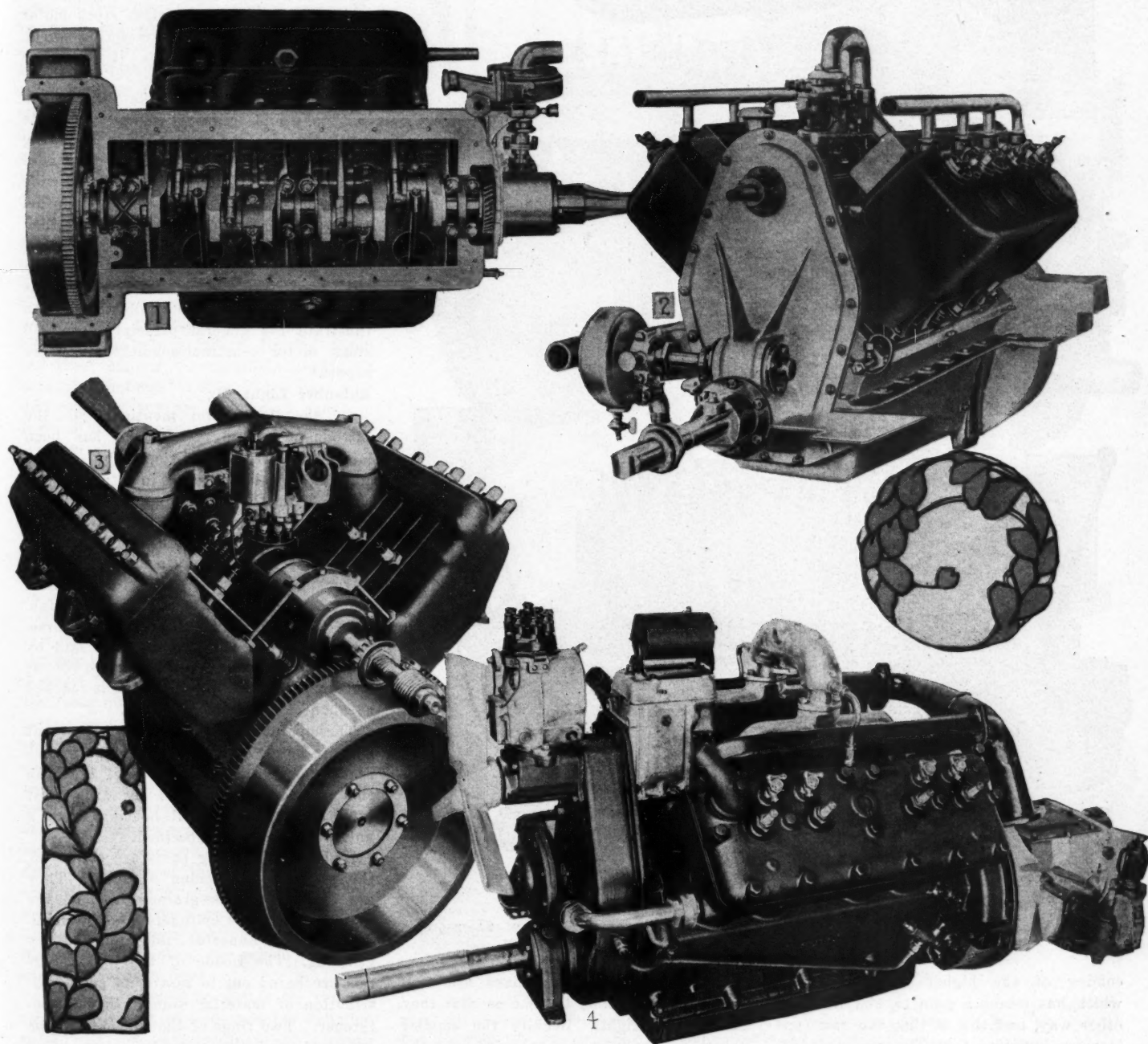
to all bearings, passing to the crankpins through holes drilled in the crankshaft. This system has been used almost universally on the V motors; eights and twelves. It is an ideal system from the viewpoint of the bearings, since the high-pressure oil increases the durability of the bushings. On a six it is rather costly, because drilling the crank is an expensive procedure, but it is fairly cheap with the simpler crankshaft of the eight. Thus we see eights with every part cared for by an individual oil feed. Usually all the passages are internal, and the owner has the satisfaction of knowing that as long as there is a drop of oil in the crankcase, the bearings are all getting their supply.

Pressure oil systems, and splash oil sys-

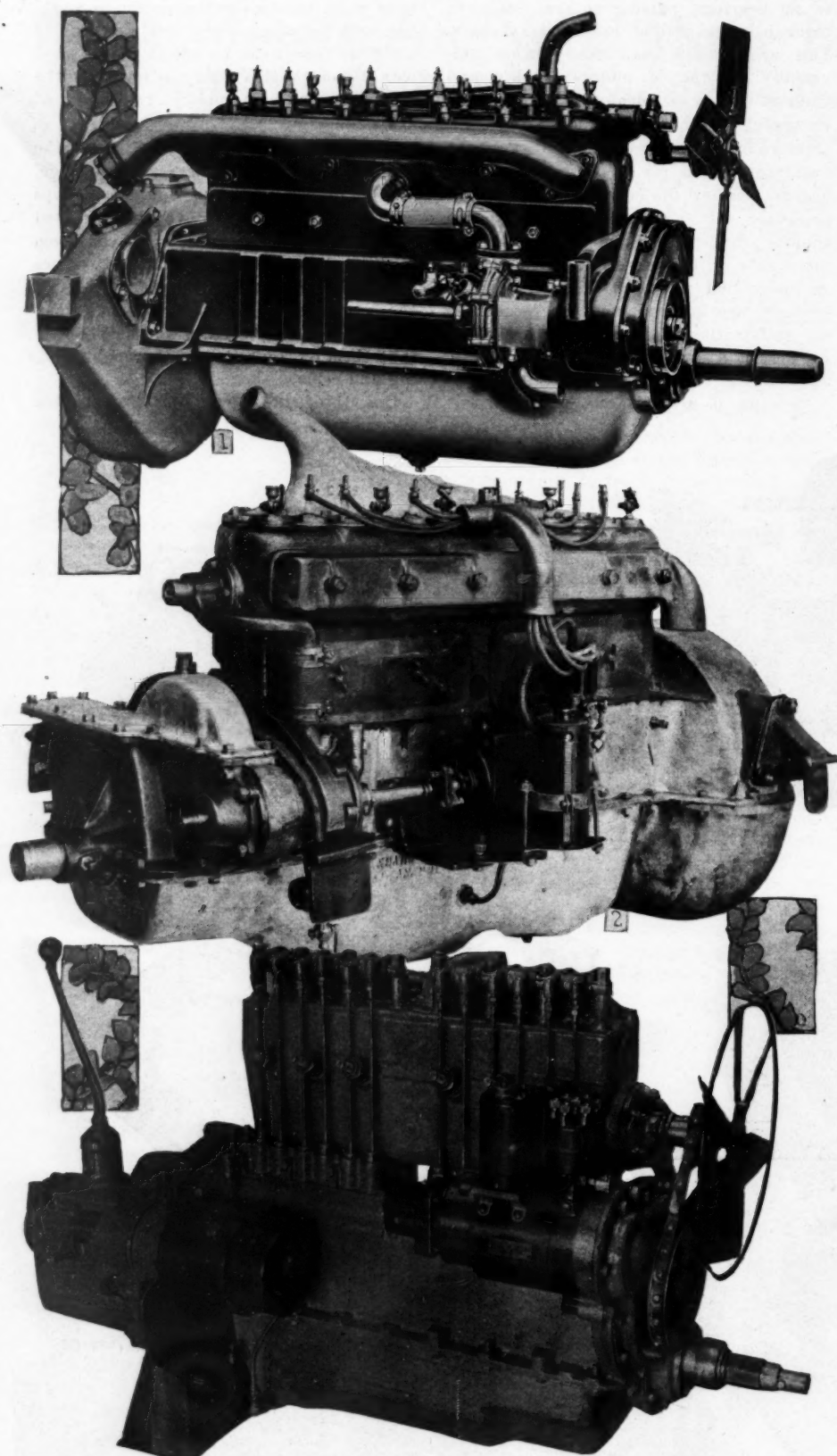
tems need, as the chief attention, a wash-out with kerosene every few months. If the filter screen can be got at it is a good plan to clean this fairly often, but the kerosene makes a pretty good job of everything.

Oil pumps are now more often of the gear type, which requires no attention, but there are still many plunger pumps used. The latter are generally located fairly high up, so as to be driven from the camshaft, and if their ball valves should fail to function properly through the presence of a little dirt, as may happen, then it is a clean and easy job to take them off, give them a thorough cleaning and replace them.

One thing the owner has lost by the



Three types of stock eight-cylinder motors. 1—Bottom of Herschell-Spillman eight with crankcase removed to show the side-by-side arrangement of the connecting rods on the crankshaft. 2—Herschell-Spillman Model V and VA eight, showing the transverse pump drive and the high location of the carburetor. 3—The Ferro overhead-valve eight, showing accessibility of the accessories in the valve alley. 4—Northway L-head eight, with the accessories mounted above the cylinders.



Three of the new sizes for the coming season. 1—Model T W Continental motor. 2—The 3½ by 5 Pittsburgh Model engine. 3—Northway overhead-valve six, 2½ by 4¾

coming of the higher efficiency motor which has meant a gain to him in every other way, and this is that the new type is more sensitive to the accuracy of adjustment of its parts. It is important that the tappets be kept in proper adjustment, so that all the valves have the benefit of

the full lift, that the valves are well ground in from time to time so that they are all gas tight. Luckily the smaller valves are much easier to grind and the modern tappets are easier to keep in good adjustment, being more accessible.

All there is to do to keep a 1916 stock

motor in perpetually good form is to see that it has a good internal cleaning periodically. All the gadgets which used to decorate the outsides of motors in years gone by have vanished and with them all sorts of irritating cleaning and adjusting operations.

Summing up, the stock motors of 1916 are better motors than the best of a short while ago. They give better performance, they are less liable to derangement, they are easier to look after. They are more economical to run, they are simpler in design, they are better value for money in all respects. Signs are not wanting that improvement is still going on, that the new models which will appear next year will show the stock motor manufacturers as still moving onward. Be this as it may, the average American stock motor of 1916 ranks high in the motoring world, higher in proportion than it ever has ranked before.

To review fully all the 1916 stock motors would require several complete issues of Motor Age, so in the following pages endeavor has been made to choose typical examples from among the wide range of engines made by most manufacturers. Sometimes the engine described is the newest, sometimes it is the one of which the greatest number are in use on 1916 cars. The review is intended not at all as a catalogue of the industry, but to illustrate the general principles of 1916 stock motor construction in their wider aspect.

Rutenber Light Six

Of the light sixes mentioned in the introductory paragraphs none has been more successful than the 3 by 5 inch Rutenber, which is used in a number of cars. With the six cylinders and upper part of the crankcase cast together, and valves enclosed with the cylinder heads detachable in one piece a simple exterior is furnished which conforms to the latest dictates of compactness and engine design. While this motor is rated at 21.6 horsepower according to formula, it is said by the maker to develop 41 horsepower at 2,000 r. p. m. The power rating is reached at about 1,000 r. p. m.

Three-point suspension is used, the front support being on the gear cover, and the rear supports by a pressed-steel beam on the standard motor and by arms cast integrally with the bell housing when a unit power plant is specified.

Light reciprocating parts are employed, the piston length being 3 inches. They are cast from close-grained iron of the same grade as the cylinders, and in manufacture are annealed and finished by grinding. The inside of the piston barrels are bored out to insure an equal distribution of material around the circumference. Two rings of the concentric type are used, and the piston pin is secured by a set-screw and cotter pin.

The diameter of the crankpins and the main bearings is 1¾ inches and the bear-

ing lengths are $2\frac{3}{4}$ inches for the front and center, with an added length of $3\frac{1}{2}$ inches on the rear to withstand the fly-wheel stresses and also the side thrust due to the torque of the starting motor.

A special brand of alloy steel, sold under the trade name E.W.P., is used for the exhaust valves. The valves are interchangeable, having clear diameters of $1\frac{1}{8}$ and lifts of $\frac{1}{8}$ inch. Mushroom-type lifters operate the valves, and lifters being hardened and ground and carried in two adjustable brackets bolted to the side of the crankcase. One of the features of the motor is the ease with which the valve brackets and lifter mechanism can be removed from the motor simply by taking out the studnuts which hold them in place. The front and center camshaft bearings are plain and the rear is an S.K.F. double row self-aligning thrust bearing. With this arrangement the camshaft can be withdrawn after removing the gear cover.

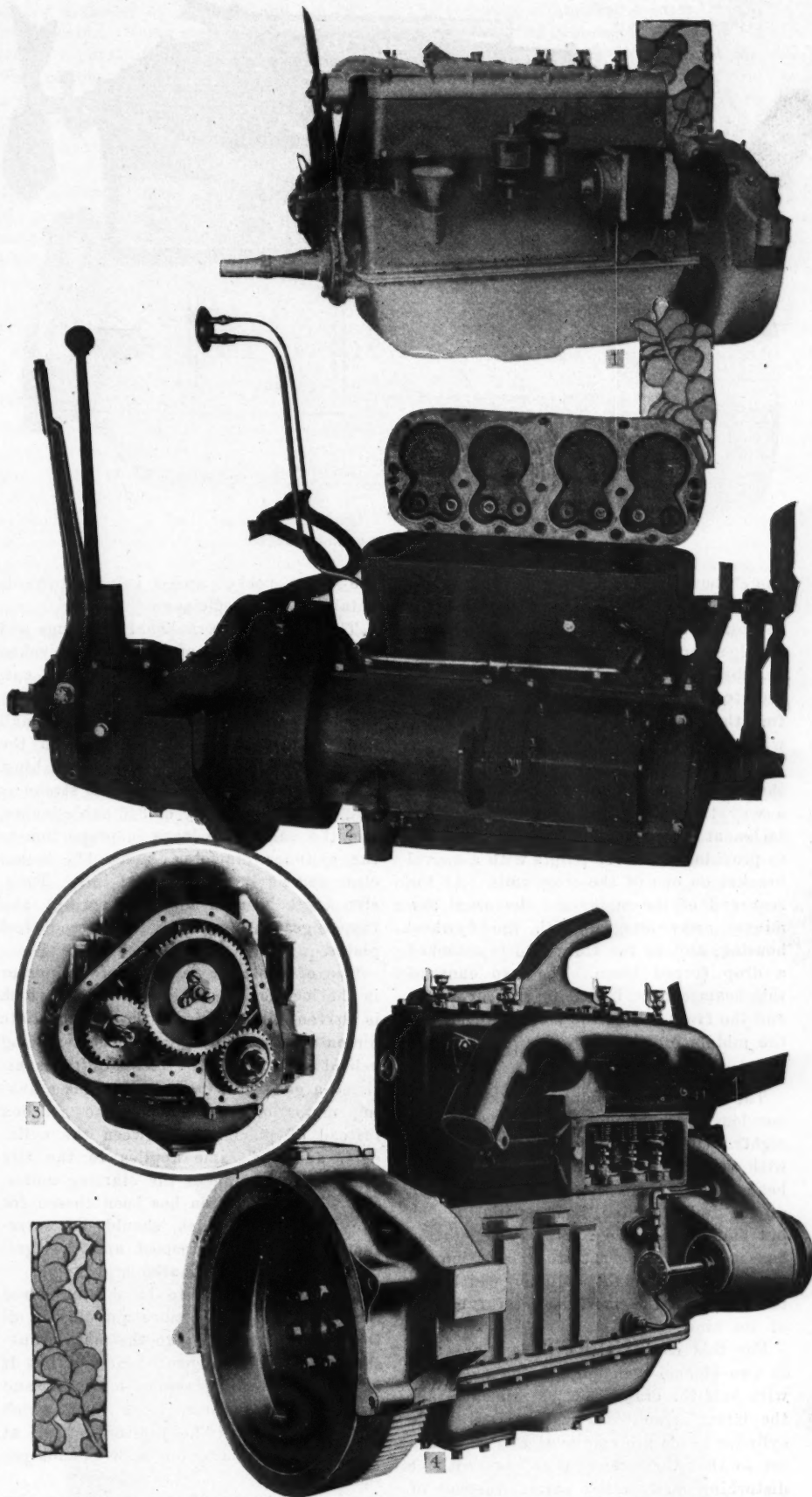
The cooling and lubricating systems are conventional, the former being by centrifugal water pump located on the valve side with an optional arrangement of drive from the generator and magneto shaft mounted in front of the ignition generator if the magneto is not used. This shaft, like all the other units in the gear drive, is operated by helically cut gears of three-quarter face and ten pitch. For lubrication, a vane pump driven directly from the front end of the camshaft draws oil through a detachable filler in the base and delivers it to troughs under each connecting-rod and to the gears. Direct feed supplies the main bearings by means of ducts cast in the walls of the upper case.

Continental Light Six

One of the most popular Continental models this year is the light six $3\frac{1}{2}$ by $4\frac{1}{2}$ inches. As a performer the engine is a fairly high-speed type; it develops 35 horsepower at 1,600 r. p. m. and will run up to 2,500 revolutions, the peak of the power curve being well up towards the maximum.

Apart from the neat appearance perhaps the most remarkable feature of the motor is the very large size of the crankshaft, which is $2\frac{1}{4}$ inches in diameter. This, it is claimed, completely overcomes vibration. This quietness is increased by the use of a new compressed cloth material for the camshaft gear. There is but little aluminum in the motor as the cylinders and upper part of the crankcase are integral, but the flywheel housing is aluminum. This saves a great deal of weight and, as the bottom portion of the crankcase is pressed steel, the whole motor is quite reasonably light.

Valves are made accessible by the removal of a cast iron, detachable cylinder head, and the valve springs and tappets are on the right. On the right side also is the magneto, when employed, or the generator and ignition unit. Drive for these is obtained by a shaft passing

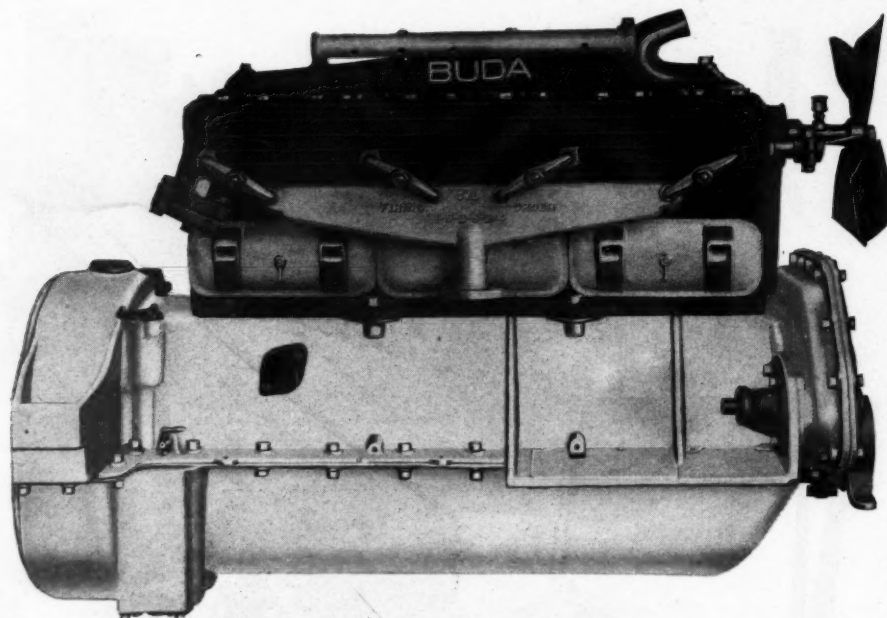


1—Rutender six Model 22, a 3 by 5 engine. 2—Golden, Belknap & Schwartz four-cylinder, Model 31, showing the removable cylinder head. 3—Timing gears of the $3\frac{1}{2}$ by 5 Continental four, showing the helical teeth. 4—Continental Model N four-cylinder.

through the water pump and there are openings on either side of the aluminum flywheel housing so that almost any sort

of cranking motor can be attached on right or left, as preferred.

On the left side there is nothing but



Model SSU Buda six-cylinder engine

the carburetor, which bolts directly to the cylinder block, all intake passages being internal, but the exhaust manifold is, as usual, a separate part.

Lubrication is by the combination force feed to the main bearings with dip troughs for the crankpins generally associated with Continental motor practice.

For setting the motor in the frame a three-point suspension is arranged in such a way that there are four points of attachment to the chassis, and this is easier to provide than three points with a swivel bracket on one of the cross rails. At the rear end of the motor are the usual aluminum arms integral with the flywheel housing, and to the front end is attached a drop forged beam. The two ends of this beam can be bolted to the car frame and the front end of the motor hangs from the middle of the beam.

Northway Motors

The Northway company makes a tremendous range of models, fours, sixes and eights. Of the two former the light six with detachable cylinder head and overhead valves, something after the fashion of the Buick engine, is a popular model, but undoubtedly the Northway reputation has received its greatest acclamation on account of the eight cylinder which has been one of the most successful motors of its kind.

For this engine the cylinders are cast in two blocks, each block being one piece with half the crankcase, which means that the latter is split vertically. Detachable cylinder heads are employed and these are set so that their removal is easy without disturbing many other parts. Instead of using rockers so as to operate the valves from only eight cams, sixteen cams are used and the tappets are of a plain straight type. A feature is that the angle between the valves is 101 degrees, so the valves are inclined towards the cylinder centers, which makes for a reduction in

the valve pocket space helpful towards obtaining high efficiency.

There are three crankshaft bearings and the connecting rods on one side are yoked in the manner which is becoming customary in eight construction. The bearing is secured in the yoke and the small end rod which fits inside moves on the outer surface of the main babbitt bushing. The bore is $3\frac{1}{2}$ inches and the stroke is $4\frac{1}{2}$, giving a capacity of 346 cubic inches, and the valves are large in proportion to the cylinder diameter, being $1\frac{1}{2}$ inches clear and having a lift of $\frac{1}{2}$ inch. Tungsten steel is used and the springs and tappet gear are inclosed by pressed steel plates.

One of the neat features of the motor is the location of the water pump, which is driven directly from the intermediate pinion of the timing gear, the latter being helical spur gearing. Accessibility is assisted a good deal by mounting the cranking motor on the side of the gearbox instead of placing it between the cylinders, and the same applies to the tire pump which balances the starting motor. Quite a high position has been chosen for the carburetor which should be correspondingly easy to inspect and the ignition timer is also mounted high.

Lubrication seems to have been cared for particularly well, since not only is oil forced from the pump to the main crankshaft and connecting-rod bearings, but it is also led to a pressure indicator and regulator and thence to a duct which floods the cams. The pressure of oil at normal speed of running is 30 pounds per square inch.

A smaller eight, $2\frac{1}{2}$ by $4\frac{1}{4}$ inches, also is made and is much the same in general design save that it has only two crankshaft bearings.

Wisconsin Fours

The Wisconsin Motor Co. always has been a protagonist of the four, and has

the honor of making the first high-efficiency racing motor of American origin, this being the engine of the victorious Stutz cars. One of the most used Wisconsin fours, and typical of several of the chief Wisconsin features is the 1916, $3\frac{1}{4}$ by 5-inch.

The four cylinders and upper part of the crankcase are cast in a single block of gray iron. The water jackets are carried entirely around each cylinder and also extend well around the valve space, only a small portion of the valve guide surface being unprotected by the waterjacketing.

The independent head construction is used by the Wisconsin concern because it is its belief that the cylinder cores by this method can be made more uniform and a percentage of wasted castings greatly reduced. Furthermore, from a user's standpoint, the valves, pistons and cylinder heads can be readily cleaned by removing the cylinder head casting. The lower half of the crankcase is made of a nickel-aluminum alloy and is so designed that when removed the crankshaft and connecting-rod bearings are accessible.

Employs Multiple Ring Piston

In piston practice, this motor is up-to-date in the use of the multiple ring system. The pistons are made of the same grade of metal as the cylinders and are ground to finish size and fitted with eight narrow steel expansion rings which are ground on both faces and on the outside. In this system of piston rings a careful fit must be made both in the grooves and in the cylinders and this is done by a finish grinding process to extremely small limits. As part of the balance scheme, all sets of pistons and connecting-rods intended for the same motor are weighed against one another and balanced when assembled with the connecting-rods.

The entire valve mechanism is carried on the left side of the motor, and valves being operated by a single camshaft with the cams bearing directly on flat push rods. The bearing contact between the cam and the follower is off center allowing the disk-shaped follower to turn on its axis, spreading the wear over its entire surface. Both intake and exhaust valves are interchangeable, being $1\frac{1}{8}$ inches in diameter and having nickel-steel heads electrically welded to carbon-steel stems. The valve stem guides are removable and can be replaced easily in case of wear. They are made softer than the stems so that all the wear will be taken on the cheapest part. The tappet guides are also separate castings and can easily be removed, being held in place by means of a forked forging. By loosening this, the complete tappet assembly including the guide, can be taken out without disturbing other parts. A removable metal plate covers the valves and being dust-proof, keeps them clean and also renders the action quiet.

Helically-cut timing gears are employed. They are semi-steel against steel and are

cut on automatic hobbing machines. The set comprises a crank gear, a cam and a magneto gear. These are all housed in the customary manner at the forward end of the motor.

No intake manifold is used, the carbureter being bolted directly against the side of the cylinder on the opposite side from the valve mechanism. A cored passage leads the gases across the cylinders and allows the gases to become heated by the water which passes around them. The exhaust manifold is located on the opposite side from the intake and is carried some distance out from the motor to insure its freedom from the other parts. The breather pipes are in the valve stem cover plates, allowing the breathing action of the motor to operate through the valve stem housing, thus carrying with it a supply of oil in the form of a vapor which insures the lubrication of the valve stems.

Lubrication is accomplished by a circulating splash system in which the circulating medium is a plunger pump accessibly located on the sides of the motor and driven off the camshaft. This pump takes the oil from the reservoir in the bottom of the crankcase and forces it through a duct to troughs under the connecting rods. The oil is picked up by the rods and enters the connecting-rod bearings through openings in the lower caps. The rods also throw the oil into pockets over the main bearings and camshaft from which it feeds through drilled passages to the bearings. The rods also throw the oil into a pocket in the rear face of the crankshaft gear and, in addition, oil is fed into this pocket from the front main bearing. From this recess, the oil is thrown by centrifugal force through drilled holes directly into the gear teeth. The oil filler is cast integrally with the cylinder and the oil gauge is located on the same side of the motor as the oil filler.

Buda Fours and Sixes

Buda motors are offered as a four of $3\frac{1}{2}$ by $5\frac{1}{8}$ size, a light six $3\frac{1}{2}$ by $5\frac{1}{8}$ and a larger six $3\frac{3}{4}$ by $5\frac{1}{2}$. The small six is represented in all the models which are all of the block type. One feature is the cooling arrangement, the water jacket space being baffled so that the water is discharged from the pump directly beneath the valves and arranged to insure a complete circulation of water around each cylinder. The top of the cylinder is provided with a removable cover, giving free access for cleaning or inspection. The base flange is extended to carry the valve lifter guides and permit of housing the guides, valve lifters and push rods, and provision for oiling these parts is made by a communication with oil from the crankcase.

The latter is made of a special aluminum alloy and is divided horizontally, the lower half serving only as an oil can. This can be removed for inspection or adjustment without disturbing the crankshaft bearings. The valves have an effective

working diameter of $1\frac{1}{2}$ inch and are interchangeable. Valve stems and push rods work in separate removable bushings.

The pistons are of light cast iron and are provided with special oil recesses and drilled with relief holes to prevent the motor smoking. Timing gears are cut helically.

Lubrication is of the combination splash and pressure feed type, the oil being pumped from the oil reservoir beneath the crankcase by a gear pump and forced through a pipe to the top of the main bearings. From these it overflows into pockets which form the splash troughs. A special lead from the pump lubricates the timing gears.

Herschell-Spillman Eight

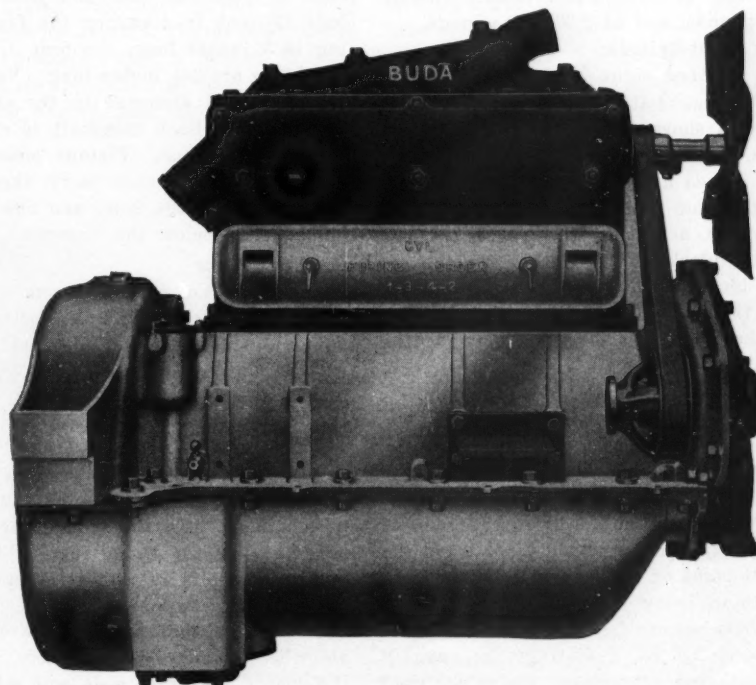
Another well known firm which make motors of many kinds and also have their eight as the most conspicuous new model is Herschell-Spillman. This eight has dimensions $3\frac{1}{4}$ by 5 and differs in several features of design, the most important being that the yoke end connecting-rod is not used, but the connecting rods for opposite cylinders are standard I-beam types which fit side by side on the crankpin, two connecting-rods attaching in this relation on each crankpin. This feature of design means that the four cylinders constituting one block are not directly opposite to the four forming the other block, but are staggered slightly, so that the cylinder block on the left is $1\frac{1}{8}$ inch forward of the block on the right. This arrangement makes the overall length of the motor practically the same amount longer, but permits of mounting the connecting rods side by side as stated and also allows of using a camshaft with sixteen cams, instead of eight cams as generally used where cylinder groups are exactly opposite. Using separate cams allows of any variation in timing.

The company established a record in the development of this motor in that but $4\frac{1}{2}$ weeks elapsed from the time it was laid out on paper until the completed job was on the testing block. The piston with its three rings weighs 4 pounds.

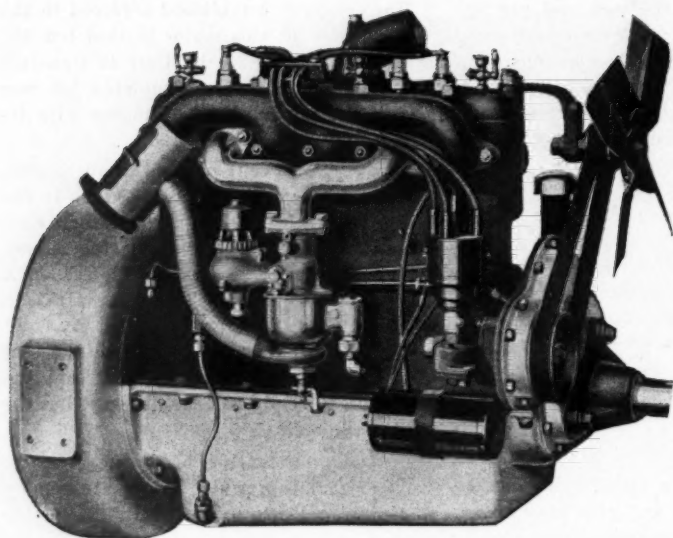
Valves are conventional bevel-seated types giving an opening of $1\frac{3}{8}$ inch in the clear. The heads are nickel-steel electrically welded to the carbon-steel stems, which are hardened at their lower ends. The lift is $\frac{3}{8}$ inch. The camshaft is a tube supported on three bearings, the front 4 inches long, the center $2\frac{3}{8}$ and the rear $2\frac{1}{4}$. All three bearings have soft cast-iron bushings, the end bushings not split but the center one split.

Particular attention has been given to water circulation which is maintained by a centrifugal pump, containing a double runner, which literally means a double pump, one portion maintaining circulation in one-cylinder block and the other in the opposite block. The pump has two discharges and separate pipes connect with each cylinder block. The return water circuit is taken at four points out of each cylinder block, these openings being opposite each exhaust valve, and the size of these openings has been determined experimentally with the thought of maintaining constant temperature at all four openings in order to keep the temperature the same at all four exhaust valves. In the cylinder casting each cylinder bore is entirely surrounded by water, there being $\frac{1}{2}$ -inch jacket space between the first and second and third and fourth cylinder bores. Intake and exhaust valve seating are entirely surrounded by water and the jackets extend to a point $\frac{1}{2}$ -inch below the top of the piston when at the bottom of its stroke.

The oiling system is a pressure one,



Model RU Buda four-cylinder engine



New LeRoi motor,
showing igni-
tion layout

without splash in the crankcase and with the oil pressure regulated between a minimum of 10 and a maximum of 40 pounds. The gear pump is located in the crankcase well on the bottom of a vertical shaft which takes its drive through 45-degree spirals from the camshaft. Oil is delivered through a longitudinal hole in the crankcase extending from front to rear and thence by three branches to the three bearings of the crankshaft and camshaft. The crankshaft is drilled with $\frac{1}{4}$ -inch opening and the oil delivered by centrifugal force to the lower connecting-rod bearings and thence through a steel tube attached to the connecting-rod, it reaches the wrist-pin bushing through a hole on the top, the oil being thus fed on the slack side of the wrist-pin journal. A blow-off valve allows of the discharge of oil to the timing gears at front which are submerged well above the cross shaft, the overflow from these finding its way back into the crankcase. At 1,000 r.p.m. the oil pressure is 18 pounds, and at 2,600, 40 pounds.

Davis Eight-Cylinder

Yet another eight is the Davis, which has the peculiarity of two camshafts. It is also a short-stroke job, being 3 by 4 inches. It is intended to run at very high speed indeed and to be used on cars with a high gear reduction. One camshaft serves for actuating the valves in one cylinder block and the other for the opposite block, the object of using two shafts being that any desired timing can be had, and the use of rocker arms between the cams and the tappets is eliminated, consequently reducing the noise possibility.

Another unconventional feature is the employment of thermo-syphon cooling for the two cylinder blocks. Water from the base of the radiator enters each block at its lowest point and well to the rear of the jacket, and the return pipes leave the highest point of the jacket at the forward end, there being individual hose connections between each cylinder block and the radiator. All valve seatings are entirely waterjacketed. Spur gear trains are used for driving the two camshafts as well as

the ignition system, a silent chain being employed to connect the crankshaft with the generator unit.

The motor is designed for battery coil ignition system with the timer-distributor element mounted on a short vertical shaft in the forward part of the V where it leaves all valve springs quite accessible. Lubrication is by a splash constant-level system and to guard against a surplus of oil in one cylinder block baffle plates are inserted in the open ends of the cylinders in this block, the other block being without baffles. The carbureter is located high in the V and attaches to an upwardly arched semi-circular type of intake manifold.

The rotating and reciprocating internal parts of the motor are generally conventional. Use is made of the yoke type connecting-rod in preference to the side-by-side style, these are I-beam types, 8 inches center to center, the crankshaft, a two-bearing type, has main and journal bearings $1\frac{1}{4}$ -inch in diameter, the front bearing is 3 inches long, the rear 4, and all crankpins are $2\frac{1}{4}$ inches long. Valves are $1\frac{1}{2}$ inches in diameter in the clear and $\frac{3}{8}$ -inch lift. Each camshaft is supported on three bearings. Pistons measure $3\frac{3}{4}$ inches in length and carry three rings close to the piston head and one oil ring immediately below the wristpin.

G, B & S Four

A few motor manufacturers specialize on four-cylinder engines exclusively, and one of the most popular fours made in this way is the G, B and S. This is $3\frac{3}{4}$ by $4\frac{1}{4}$ inch and is an extremely neat powerplant. It is one of the few American engines with a chain front-end drive; camshaft, magneto and electric generator being all chain driven. There is a simple adjustment for the chains. The cylinder has a detachable head held down by a reasonably small number of bolts so that it is easy to remove for access to the valves. There is a large crankshaft with three bearings, and the crankcase is extremely rigid, so the motor performs well and with very little vibration.

Valves have a clear opening of $1\frac{1}{8}$ inch and a lift of $\frac{3}{8}$ inch so the gas can get freely in and out. The intake is divided with a Y-branch external manifold and this bolts on just beneath the exhaust manifold where it has every opportunity for keeping warm.

For lubrication there is a substantial plunger pump, which is operated off the rearmost exhaust cam, and this sends oil to a sight feed on the cowl board whence it is led through pipes to the three main bearings of the crankshaft. Overflow from these bearings fills dip troughs which care for the lubrication of the rest of the motor with the exception of the chains, these having a separate feed of their own direct from the pump. Altogether it is a very convenient and rugged little motor and has a good reputation for standing up in hard service.

Ferro Eight

Perhaps the Ferro eight is the most original of all its class with its distinctive overhead-valve mechanism and all eight cylinders cast in one block of iron. This one-piece cylinder construction gives great rigidity to the crankshaft bearings, and the rest of the motor is so designed that the cylinder block can be regarded as part of the frame of the car.

All bearings are laid bare by detaching the bottom part of the crankcase and the valves come away with the detachable cylinder heads. Having the valves overhead with the tappet adjustment on top of the cylinders enables the V between the cylinders to be used for accessories without any loss of accessibility.

The valve adjustment is one of the most ingenious parts of the design. Each rocker is a small, light drop forging and has at the center a cup-shaped hole ground out hemispherically. One end of the rocker rests on the valve and the other end on the top of the push rod coming up from the single camshaft, while a bolt with a spherical head is screwed down through a socket or lug in the top part of the cylinder head casting.

Externally, one sees the upper ends of the bolts, each with a lock nut on it. Now, to adjust the valve it is only necessary to slack the jam nut and screw the bolt downwards, so depressing the rocker and taking up any slack. This is best done when the motor is running slowly, the correctness of adjustment being found by taking the push rod between finger and thumb and rolling it. If it can just be turned, adjustment is right; if it moves too easily, it is slack and if it will not move, it is too tight. The spherical rocker joint, of course, is oil retaining and so self-lubricating.

Lubrication is interesting as there are four main leads from the gear pump located at the front end and these are divided as follows: One goes to each of the end bearings of the crankshaft and passes oil through the drilled crank web to the compound connecting rod bearings

of the end cylinders, and to the center crankshaft bearing are two leads separated slightly so as to give individual feeds to the two middle crankpins.

The motor is made in two sizes, 3¼ by 4 and 3 by 3½, the design being the same in general principle for both.

Perkins Fours and Eight

This motor is best known, probably, in its four-cylinder form though the manufacturers also produce an eight which has been adopted for several chassis. There are several sizes of fours, notably 2¾, 3½ and 3¼, all with a stroke of 4 inches. These different sizes are almost identical in detail, the main variant being in the cylinder bore only. The crankshafts each have two bearings, and a diameter of 1¾-inch while the valves are all 1¼-inch with a ¼-inch lift.

Lubrication is by combined pressure feed and splash, the pump sending lubricant to the main bearings and the connecting rods dipping in troughs formed in the lower part of the crankcase. The motor as a whole is characterized by extreme simplicity and excellent accessibility; it has a good speed capacity, developing maximum power at 1,800 revolutions per minute.

The new motor this year was the eight, which is a conventional L-head design 3½ by 4½ inches developing maximum power at 2,250 revolutions per minute. It is one of the few eights in which part of the lubrication is performed by splash from dip troughs, there being direct bearing feeds from the pump as well. Vibration is cut by the use of very light aluminum alloy pistons, these weighing only .8 pound apiece. There are only two main bearings on the crankshaft, which again is unusual in eights, though experiment has shown the undoubted possibilities of eliminating the middle bearing, owing to the naturally great rigidity of the eight.

New Sterling Eight

From the Sterling plant come motors of many kinds, from big marine engines for powerful motor boats, down to small

engines for cyclecars. It may be remembered that the wonderful, if minute, motor used in the little Cornelian car that Louis Chevrolet drove at Indianapolis this year was a Sterling, and much the same as the stock motor used for the Scripps-Booth.

The latest Sterling engine is a little eight which will be used for several cars next season and is expected to find many friends. The eight cylinders are in one piece with the top of the crankcase and the valves are in the head, as with the popular small Sterling fours. A single camshaft with sixteen cams operates the valves through push rods and rockers mounted on the detachable cylinder heads and a feature is that the rocker fulcrums are readily adjustable, so that the tappets can be set up without removing any portion of the cover plates and without having to reach anything less accessible than are the spark plugs of a vertical motor.

Lubricant is fed from a high-pressure pump to the two crankshaft bearings and dip troughs care for the connecting rod bushings. Vibration is eliminated by using a crankshaft of immense strength and providing it with rigid support in the crankcase.

Using the overhead valves allows the central alley of the V between the cylinder blocks to be utilized for electrical equipment. There is room for quite a big single unit motor-generator. For keeping in efficient condition, the overhead valves and detachable cylinder heads should prove a blessing to the owner as it would be possible easily to clean out the combustion heads by removing and scraping them in very little time indeed.

Model Light Six

The ever-popular 3 by 5-inch six again makes an appearance amongst the Model motors, this time in a quite high-speed design giving maximum power at 2,500 revolutions per minute. Large valves, 1½ inch in diameter with a lift of ¼-inch, are used, as are light cast iron pistons.

In this engine, good commercial light-

ness has been studied, in the moving parts especially. The pistons are iron, but of thin section, and it is noteworthy that they have the wrist pins secured to the castings instead of in the small ends of the connecting rods which once was more usual. Then too, the valves are slender, though with ample diameter, and the tappets are hollow so as to get the largest possible bearing area with the minimum of weight. There are no rollers, the flat heads of the tappets rest directly upon the cams, so providing a quick lifting action and rapid closing while the large area of contact insures quiet operation.

Lubrication is by circulating splash in which accurately constructed dip troughs are kept filled with oil supplied by the pump. At the front end both gears and a chain are employed, a gear to drive the camshaft and a chain for the electric generator.

Falls Fours and Sixes

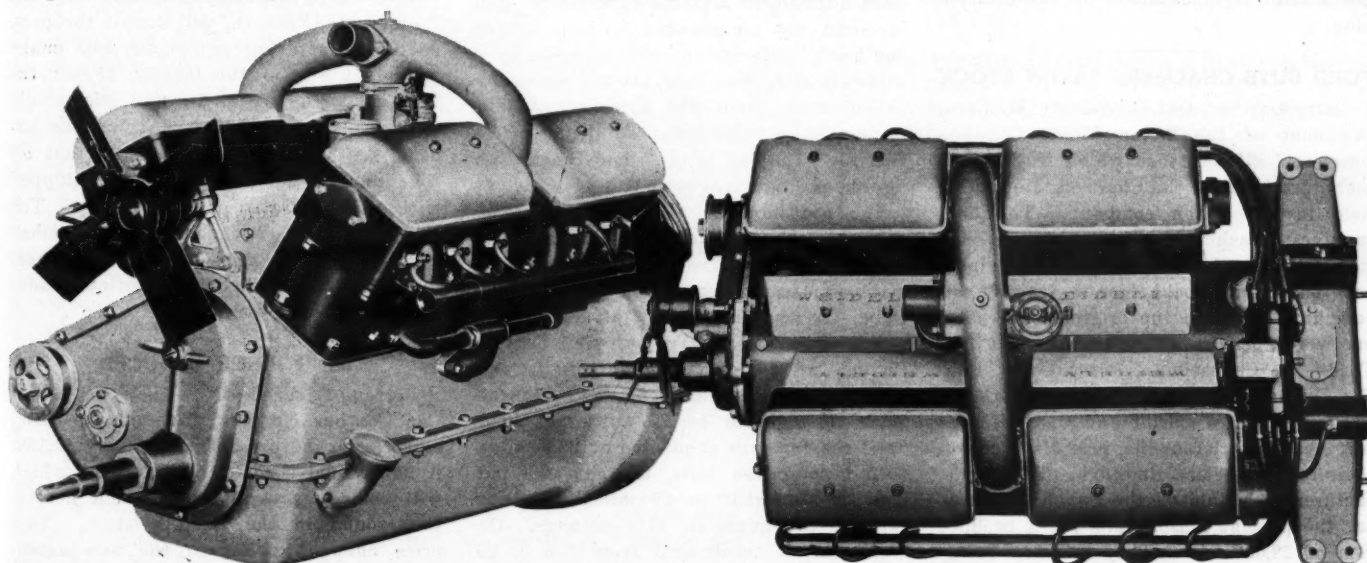
The Falls Machine Co. has a light six and three types of four-cylinder motors, ranging in size from 3¼ by 5¼ to 4½ by 5. The small six is a 3 by 4¼ and is featured by the use of overhead valves. It has thermo syphon cooling, combination pressure of splash lubrication, and three bearing crankshaft. The valves have cast iron heads, electrically welded to carbon steel stems.

One of the fours likewise has the overhead valves, while the others are the conventional L-head type. Timing gears in all motors have helical teeth.

LeRoi Motor

Designed with a view to high efficiency and economy, with as little weight as possible consistent with strength in order to insure long life for crank and crankshaft bearings, the LeRoi, four-cylinder motor is announced by its maker, the Milwaukee Machine Tool Co., Milwaukee, Wis. The cylinders are block-cast, with the crankcase integral.

Cooling is by thermo-syphon and care has been taken to have ample passages for the circulation of water around the valves,



New Weidley eight, showing clean valve alley and accessible arrangement of double timer

there being fourteen openings between the cylinders and cylinder head, through which the water circulates, the head being detachable to give immediate access to valves and pistons. Cylinders measure $3\frac{1}{8}$ by $4\frac{1}{2}$ inches.

A combination of pump and splash lubricating system is used and the timing gears are helical cut to insure quiet running. Valves are large in diameter and have a moderate lift. They are operated by the mushroom type push rods and have easy action on the cams, designed to eliminate noise in running.

1,000 OVERLANDS A WEEK

Toledo, O., Oct. 29—Within a few weeks, the Willys-Overland Co. expects to increase its production by 1,000 cars a week. Everything possible is now being done to hasten the completion of the additions under way, and, when these are ready, additional machinery installed and everything put into full operation, it will mean that the working force of the plant will be increased probably by 10,000 men.

FORM CANADIAN BRISCOE CO.

Montreal, Oct. 30—Carriage Factories, Ltd., of Canada, has formed the Canadian Briscoe Co. as a subsidiary. The latter will assemble the parts in Canada from the American Briscoe company, the cars of which will be sold through the Carriage Factories company. This company has acquired the carriage manufacturing end of the McLaughlin Motor Car Co.

ASK GASOLINE PRICE INVESTIGATION

Washington, D. C., Oct. 30—Request has been made of the federal trade commission to institute an investigation of charges that illegal practices prevail in the marketing of gasoline. Price fluctuations have been brought to the attention of the commission, which, it is declared, are not explained by the difference in freight rates between the cities where the varying prices exist. A thorough investigation of the matter is to be made by the commission.

FORD BUYS CHALMERS SAXON STOCK

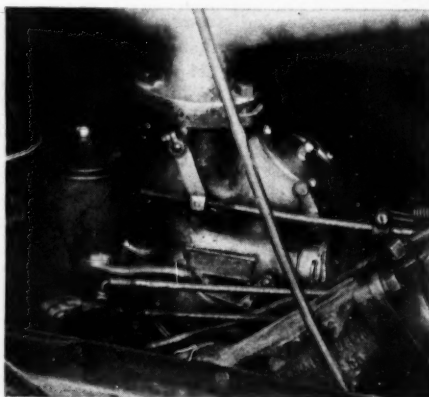
Detroit, Mich., Oct. 30—Harry W. Ford, president of the Saxon Motor Co., has purchased all the stock which Hugh Chalmers, president of the Chalmers Motor Co., held in the Saxon company. The deal involves a cash transaction of half a million dollars and makes Mr. Ford the largest individual stockholder in the Saxon company, of which the original stockholders were—besides Mr. Chalmers and Mr. Ford—Lee Counselman, Percy Owen, Geo. W. Dunham, and H. H. Pinney, C. A. Pfeffer, C. A. Woodruff and C. C. Hinckley, the latter four having disposed of their interests some time ago. The manufacturers schedule of the Saxon company for the present season calls for a production of 28,600 cars. They are now being shipped at the rate of 100 per day.

Edward's Fuel Test

New Carbureter Shows Economy of 28.9 M. P. G.

On Five-Passenger Buick Six Same Setting Gives 58 M. P. H.

CHICAGO, Oct. 29—The Edwards' carbureter was introduced to Chicago yesterday by an economy, speed and acceleration test conducted by the technical committee of the Chicago Automobile Club under sanction of the American Automobile Association. An economy of 28.9 miles per gallon and a speed of 58 miles per hour with the same carbureter setting was obtained on a Buick small six. The test was made by the National Carbureter Co., manufacturer of the new Edwards



View of Edwards carburetor installed

carbureter, and was supervised by Chairman F. E. Edwards, of the Chicago Automobile Club technical committee.

The car was a five-passenger Buick, model D-45, which has a six-cylinder 3-4 by 5-inch motor, with overhead valves, Delco ignition, lighting and starting. The carbureter was a $1\frac{1}{4}$ -inch size and was fitted with an exhaust air heater. The dash adjustment was disconnected so that it could not be changed without lifting the hood. Silvertown cord tires, 32 by 4 inches in size, were used, the top and windshield were down and three passengers, beside W. A. Edwards, the driver, were carried. The car is the same Buick that figured in the Stromberg test recently.

The economy run was made over Chicago boulevard system, with a route arranged, so that the car went approximately an equal distance in all four directions. A measured gallon of Red Crown gasoline, having a gravity of 59.1 degrees Baumé, at 60 degrees Fahrenheit, was poured into a special tank, and the run made at a speed of 20 miles per hour until the fuel was exhausted at 28.9 miles.

In acceleration tests, the car was put from a standstill to 25 miles per hour through the gears in $11\frac{1}{2}$ seconds. On high gear, it accelerated from five to 25 miles per hour in $11\frac{1}{2}$ seconds.

Without changing the setting of the carbureter than that used on the economy run, the car was taken out into the country, where it showed a speed of 58 miles per hour on the speedometer.

The National Carbureter Co. is a new Chicago concern and the Edwards carbureter is the design of W. A. Edwards, formerly connected with Rayfield and Stromberg factories.

RANDOLPH TRAILER IN FOUR SIZES

Jonesville, Mich., Oct. 29—The Randolph auto-trailer is made by H. C. Randolph, successor to the Standard Auto Trailer Truck Co. It sells for \$45 and upwards, according to load capacity, steel or rubber tires and the kind of axles.

There is only one model, G, but it is made in four different sizes, as far as loading capacity is concerned. The trailer, with a 1,000-pound capacity, has $1\frac{1}{8}$ -inch steel or rubber tires; the one with a capacity of 1,300 pounds has $1\frac{1}{4}$ -inch steel or rubber tires; with a load capacity of 1,600 pounds, the tires are $1\frac{3}{8}$ -inch steel or rubber, and they are $1\frac{1}{2}$ -inch rubber or steel for the trailer carrying 2,500 pounds. There are two series, the first one having a D. C. axle and the second series a Timken.

The body is 6 feet 10 inches long, 38 inches wide and 7 inches deep. The net weight of the trailer is 350 pounds and 425 pounds when ready for shipment.

INTERNATIONAL TRUCK PRICES

Chicago, Nov. 1—The International Harvester Co. of America announces sweeping reductions in prices on all models, setting a new mark in values on motor vehicles of standard construction. The line now contains four types of trucks, for loads of 1,000, 1,500 and 2,000 pounds, ranging in price from \$600 to \$1,500. Two new models have been added this year—one of 1,500-pound capacity, which will sell for \$950, and a 2-ton truck, the chassis of which sells for \$1,500.

Two large six-story additions to the factory at Akron, O., will double the present manufacturing equipment and make the plant one of the largest, if not the largest, in the world devoted exclusively to motor truck building. Among the unusual features are noted the fact that all four models now may be had equipped with either solid or pneumatic tires. The two $\frac{1}{2}$ -ton capacity models are furnished with either 36-inch or 42-inch wheels best to fit the trucks for the conditions under which they will operate.

KING PRICE REDUCED

Detroit, Mich., Nov. 1—The King Motor Car Co. has cut the price of the King eight \$200, the present price being \$1,150. A new model is under construction, which will embody several features not heretofore found in the King product. This price change applies to the five-passenger touring car model.

NEW YORK, Oct. 30—New York state motor car owners are to have a distinctive number plate for use next year. The numbers on the plate will be hyphenated. A dash will separate the figures of the hundreds from the thousands. New York state is to be divided into three registration zones—New York, Albany and Buffalo. Plates have been designed for each. Cars registered in the Buffalo zone will carry the letter "B" before the numerals on the plate; those of the Albany zone will have the letter "A" in the same position. New York city zone plates will have no letter.

The 1916 plates are practically the same size as those now in use. The numerals of dark blue will have a cream back ground. Both the idea of the hyphenated number and the zone divisions originated with Secretary of State Francis M. Hugo, who by virtue of his office, heads the largest motor car bureau in the world. New York state now averages a car to every forty-four of its residents.

Easy to Remember

The advantage of the hyphenated number plate easily is seen. Its adoption will prove a boon to the motorcycle officer, the policeman or the person who catches but the glimpse of a license plate, and yet often is called upon to remember the exact figures.

The use of the hyphen was adopted only after a number of experiments had been made in the state vehicle bureau. Paste-board number plates bearing the five figures both with and without the hyphen, were held up the fraction of a second be-

Hyphenated License Tag

New York Adopts Change After Experiment

Divides State Into Three Zones—Five-Figure Limit on Plates

fore the employees. Nine times out of ten the hyphenated number was remembered. The ordinary mind showed its ability to grasp and retain the first two figures, then relaxed for the millionth part of a second, grasped the remaining three figures and fixed the whole indelibly in the mind.

In order that the new number plates may serve their purpose in the fullest sense of the word, Secretary Hugo decided to place the "N. Y. 1916" beneath, instead of before the registration numbers, as now is the case. This arrangement effectually prevents any confusion at night when a letter or a figure may be taken in the light of the tail lamp to be a part of the registration number itself.

The zone idea is an innovation. It probably will find approval in other states in which there are large cities, widely separated, and where the number of cars registered runs into the thousands. The division of the state into zones does away with the necessity of using six figures on the plates. It also serves as an index to the locality from which the car comes.

In the New York city zone next year the cars will carry plates with registration numbers running from 1 to 1,000 and from 18-001 to 95-000; the city's commercial cars

having numbers that will start at 3-001 and run to 18-000. There is a break in the series of numbers in all three zones from 1-000 to 3-000 inclusive, due to the fact that this series is reserved for the dealers the number of plates to be allotted each zone being determined by the latter demand. The letter "M," which indicates a dealer's plate, will precede all numbers from 1-000 to 3-000.

All cars registered in the so-called Albany zone will carry distinctive plates with the numbers starting at A 1 and going to A 1-000 and from A 10-001 to A 57-000. The commercial cars in the Albany zone will have plates with the numbers running from 3-001 to 10-000, each with the letter "A" preceding the numerals.

In the Buffalo zone the number plates will carry figures starting with B 1 and going to B 1-000 and from B 10-000 to B 67-000, the commercial cars running from B 3-001 to B 10-000.

SIMMONS DISTRIBUTES U. S. TIRES

St. Louis, Mo., Oct. 30—What is said to be one of the biggest tire deals ever closed was effected last week between the United States Tire Co. and the Simmons Hardware Co. According to officials of the tire company the transaction involved a million dollars' worth of tires. Hereafter the Simmons company and its branch houses in Philadelphia, Toledo, Memphis, Wichita, Kan., and Sioux City, Ia., will distribute United States tires. The several hundred traveling salesmen of the hardware company also will become selling agents for these tires.

PATHETIC FIGURES



—Reprinted from the Chicago Daily News.

One man putting up a one-man top, assisted by several women

The Wonderful One-Man Top

By William K. Gibbs

The one-man top is a wonderful thing,
If you hark to the song that the ad men sing.

With the gear set in high, one eye on the cop,
And one hand on the wheel, you put up the top.

The designer is thoughtful, a deep-thinking man,
Who sought to relieve you, of work, all he can.

He's given to motorists a boon that is real,
If you hark to the silver-tongued ad man's spiel.

The term, "one-man top," most always is found

To mean that one man must be on the ground,
And have the assistance of women or men
To get the top down—or else up again.

When I hear someone say, "My top's a one-man,"

I'm tempted to try, some day when I can,
To coin a new phrase that's more nearly the truth,

For the industry needs it. The one-man? Forsooth!

Routes and Touring Information



Mount Rainier from Paradise valley. The perpendicular bluff on the right is Gibraltar, which has been chewed away by glacial action

The Morning After—a Recounting of the Magnetic Charms of Rainier National Park Which Was Visited by Europe-Denied Americans This Year for First Time

By Frederic Wagner

MARS was the impelling force that sent thousands upon thousands of American motorists to the West this year in search of recreation and enjoyment that, heretofore, they had sought in the historic fields of the old world. He turned them back rudely, and along with them the \$200,000,000 which the American tourists annually contributed to the coffers of Europe.

This huge wave of travel is now on the ebb tide. The sensation-seeking invaders from the eastern half of the United States have come, explored and returned home satisfied; gone away better acquainted with the land of their birth and thoroughly convinced that these plain old states of Uncle Sam are not so bad after all. They were dumbfounded at the grandeur and magnificence of the West. It was an education for them, the beginning of better appreciation of their native land. They found conditions altogether different than their imaginations had pictured before they started westward on

their momentous exploring expedition. They missed the "Diamond Dick" desperadoes that their hallucinations had told them would be encountered frequently; there were no Indians, armed with bows and arrows and tomahawks, to leap out upon the highway and throw terror into their hearts.

A Different Country

Yes, indeed, it was a different country—so beautiful, so interesting, and populated with people with hearts as big as the moon. And the cities; they were amazing; well lighted, with palatial hotels where true western hospitality conspicuously was present, miles upon miles of paved streets and scenic driveways.

Christopher Columbus could not have been more surprised upon locating the continent of America than these chronic Europe-goers who had drifted westward for the first time. They not only were surprised; they were delighted beyond ex-

pression. And to think it was in the United States!

Now that the shades of fall are spreading over the fields which but a few weeks ago were dotted with human beings interestedly gazing on nature's handiwork, the time has come to glance back over the 1915 touring season and study its results and benefits.

One thing stands out strikingly—1915 witnessed the greatest volume of travel westward that the United States has ever known. Definite figures on the volume of travel are lacking, but there is not the slightest doubt about its record-smashing achievements. California, Oregon, Washington and even the Canadian province of British Columbia shared generously in the business created by Americans seeing America. All the West, in fact, is better off by the closing of the European gates by military strife.

This vast concourse of people from the region east of Rocky mountains has brought about some changes in the West,

too. Long have Pacific coast residents imagined that they appreciated what scenic glories nature had bestowed upon them, but it took the penetrating superlatives of the astounded visitor to bring to them a sudden and full realization of what wonderful attractions they had for the recreation seeker.

There is one striking example of this progressiveness and preparedness. It has to do with Rainier National park, that vast wonderland of natural splendor which surrounds the base of Mount Rainier, eternally snow-crowned and piercing the clouds to a height of more than 14,000 feet, a mighty rugged monarch of the Cascade range in Washington. It is the supreme scenic wonder of Uncle Sam's great Pacific Northwest and destined to rank among the famed beauty spots of the world.

Rainier National park comes under the administration of the United States government, but it is not now fettered by federal red tape as it has been in the past. True, the care it received under the protecting wing of the department of the interior during the first few years of federal possession was about as enthusiastic as that accorded a stepchild, but the park proved too big, too grand, to be lightly regarded.

Westerners have determination and punch. They kept hammering away for recognition for the fairyland of nature at the base of the majestic peak with the persistence of Demosthenes. Congress contributed small appropriations from time to time for the building of roads and trails, and with this improvement came developments and exploitation of the varied and rich grandeur of this region in the heart of the Cascades.

Attendance Record Gains

Year by year the number of persons visiting the park has increased until the 1915 season the attendance recorded a gain that probably is without parallel in the history of national parks in the United States. It has been responsible for the launching a few days ago of a development campaign that assures Rainier National park a place among the scenic kings of the universe.

What it has needed is the development of trails and roads to sections of the park not now accessible; it has needed exploitation, widespread dissemination of knowledge about its wonders. It is not necessary to exaggerate about Rainier's beauty, for facts are powerful enough. And here a debt of gratitude on the part of Washingtonians is paid Motor Age for devoting so much valuable space during the summer months to spreading the gospel of the Northwest's scenic resources. It achieved Herculean results in battering down the barrier of misunderstanding that, until this year, kept easterners out of the West.

To appreciate what Mount Rainier and its natural playground mean to Washing-

ton and the Northwest, let me carry you back a few years. It is the beginning of a story of a mighty struggle to awaken Americans, to urge them to come to worship at the shrine of Nature. The plea has been heard and answered, and the park is now in meteoric ascendancy.

Park Born in 1899

In 1899 Congress withdrew a tract 18 miles square, 207,360 acres, from the 2,146,600-acre Pacific forest reserve and designated it Rainier National park, for the "benefit and enjoyment of the people." It was not until 1906, however, that construction of a wagon road into the new playground was begun. Nature lovers did not wait for a boulevard. They trekked in over the old rutted dotted highway to the number of 1,786 in that year.

In 1908 the attendance had grown to 3,511, and the next year the army of sight-seers grew to 5,968. It was another case of continued increase in 1910, during which season 7,830 admirers of nature passed through the massive log entrance to the park.

Uncle Sam took down the bars against motor cars in the park in 1911, and then began the real spectacular growth of this wonderland. In the 12 months ended October 1, 1911, a total of 10,500 names were written on the registration book, and a fleet of 1,053 motor cars were registered. The next year, 1912, is conspicuous as the only one in which a gain was not made, compared with the previous twelve-months, for the figures dropped to 8,946 persons and 869 motor cars. Adverse weather and wretched road conditions are the agents that caused this, for it was not the lack of interest in the park and its environment.

The year 1913 made good with a vengeance, however, for in that period 13,501 persons found their way into the vault of scenic glory, and the fleet of twentieth century road cruisers had grown to 1,626, which, of course,

is exclusive of the motor stages that make regular trips from the railroad station to the park. In 1914 the park maintained its reputation for increasing popularity, recording the names of 15,038 persons and 1,594 cars. There was a slight falling off, it is observed, in the number of cars that invaded the park.

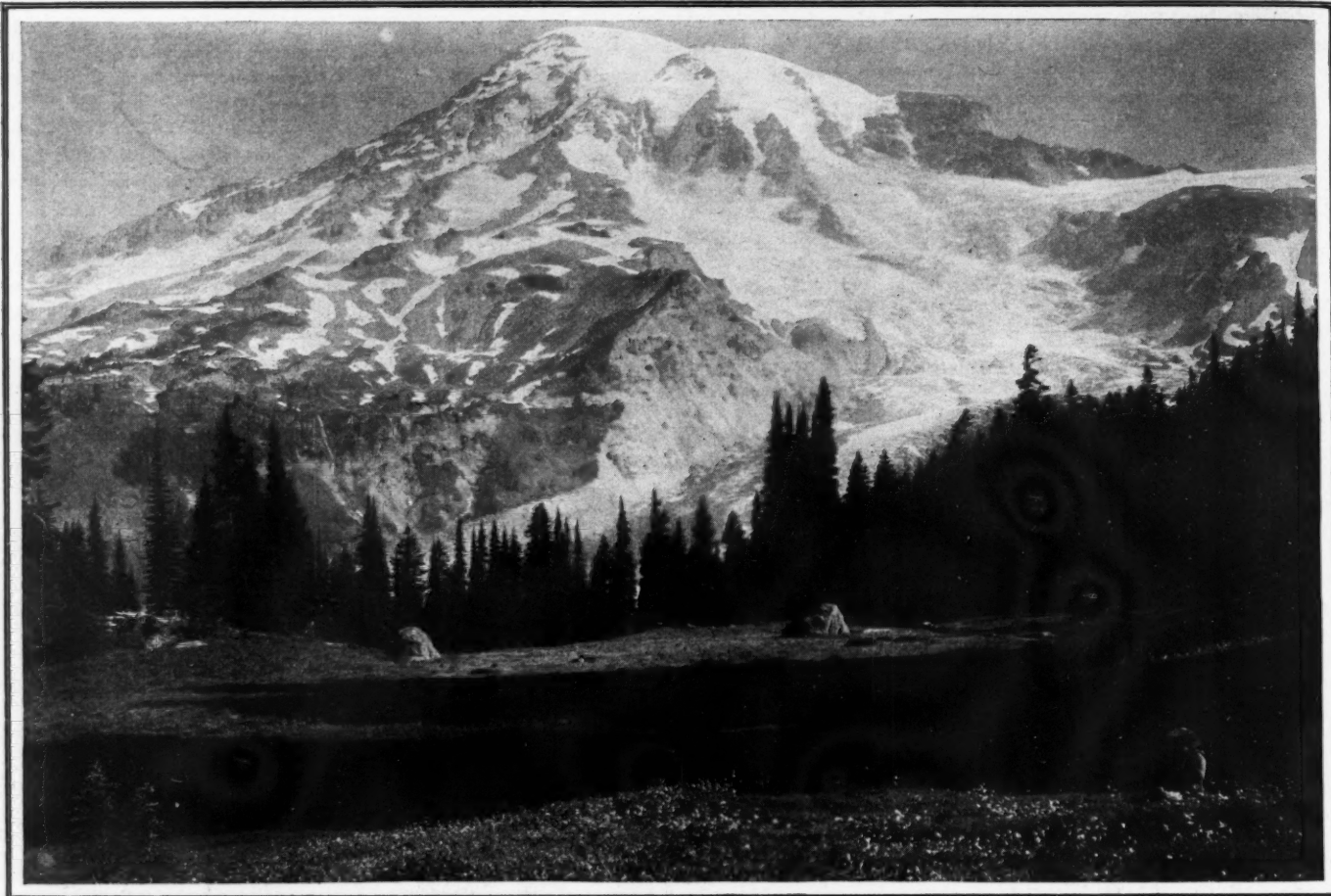
Enters now the season of 1915, which was officially closed on October 1, although the gates of the park are open the year round. It stands out as the greatest twelvemonth in the history of this fairyland of nature. It eclipsed all previous records for attendance and number of cars; it established a record for growth that is believed to be without parallel in the history of the nation; and it marked the beginning of an era of gigantic and systematic development that cinches the place of Mount Rainier as a world-renowned summer resort.

34,814 Visit Park

During the 1915 season Rainier National park greeted 34,814 persons, as compared with 15,028 a year ago, a gain of 19,768, or more than double the 1914 record. The invasion of cars likewise assumed huge proportions, growing from 1,594 a year ago to 5,029.



Narada falls as seen from Paradise valley



Mount Rainier as seen from one of the flower-carpeted sections of Paradise valley

The most encouraging feature of this splendid showing is in the attendance of visitors from outside the state of Washington, whose numbers reached 12,089. Compare this figure with 2,251, the previous record, and you get a more thorough appreciation of the park's far-reaching popularity. Also, it is convincing in showing that its marvels have reached the attention of eastern visitors. While the number of Washingtonians touring the park this year showed a substantial gain over previous years, the phenomenal growth in outside patronage is the dynamo that furnished the energy for the ambitious plans just launched. It is taken as conclusive evidence by the government authorities and by the commercial interests of the Puget sound country that Mount Rainier and the national park have become established as a nationally-prominent resort and that it is just entering on a period of continued meteoric growth.

Company Will Operate Concessions

The result of Secretary Mather's survey of the field this year has been the formation of a company to acquire and operate all the concessions within the park boundaries for a period of 20 years, thus eliminating the old system of independent management of the various hotels and camps. A committee of six business men and financiers of Seattle and Tacoma, which cities are most closely situated to the mountain are to complete the organization

of a corporation to handle the gigantic development scheme. The success of the undertaking is assured. A sum of \$75,000 has been guaranteed for the construction of a magnificent hotel in Paradise valley, an elevation of 5,800 feet above sea level. This building now is in course of construction and will be ready for occupancy when the 1916 season opens next June. The company will take over the National Park inn, originally built by the Chicago, Milwaukee & St. Paul Railway Co., at Longmire Springs; the Indian Henry trail concession; the Indian Henry Hunting Ground camping grant and the motor transportation system operating from Seattle and Tacoma and from the Ashford railway station to the park. This latter concession includes only public passenger cars and in no way affects privately-owned motor vehicles.

This company has not been formed solely with a view to making money, for the United States government is a partner. Above a certain figure the profits of the concern will go to the government for the development work in the park, as is done with the fees charged for permits to take cars into the reserve. Stock in the company will be sold in small lots throughout the Puget Sound district, for the business men of Seattle and Tacoma realize that Rainier National park is one of the greatest assets the country could possess, and they are bending every energy in ex-

pediting its development and exploitation.

What is there so wonderful about this park, you may ask, as to make it the tourist magnet of the Northwest; to cause its popularity to increase the attendance from 1,786 to 34,768 in 10 years; to engender such enthusiastic, unified promotion spirit of business interests.

Fairyland's Crown—Mt. Rainier

It is Mount Rainier, fascinating by its diversity and inspiring by its lofty ruggedness and grandeur, the crowning glory of this fairyland of nature. Rising majestically 14,408 feet above the Cascade range, Mount Rainier is overwhelmingly impressive, both by the vastness of its glacial mantle and by the striking sculpture of its cliffs. From Puget Sound or from any of the various lakes one is inspired by the bulk, the dominance and yet the grace of this noble and fickle shape of rock and ice and vapor. It is impressive, indeed, from the fact alone that it is one of the few great volcanic mountains whose entire height can be clearly seen from tide water. It appears as a gigantic mound of rock, ice and snow carefully placed on the top of the vast forest.

Mount Rainier is fickle because of lightning-like changing moods from peacefulness to storm. It is called the "Mountain that was God," because, to the Indians, who hunted in the forest on its slopes, or fished in the streams that ebbed and flowed

ing-Pan, Van Trump and Interglacier. They are of what is known as the Alpine type—moving rivers of ice.

These vast rivers of ice are constantly in motion, their flow varying with the volume, width and slope of the bed. As the years roll by their level is being lowered by the rays of the sun. Earth and rocks are constantly accumulating upon the surface, and the debris is scattered by rains and melting snow, until the lower reaches of the glacier are completely covered. It is at the snout, where it breaks off in great chunks and forms frigid caves, such as at the nose of Nisqually Glacier seen from one of the driveways, that one begins to get a faint idea of the staggering size and weight of this solid mass of ice, its millions and millions of tons of weight and constant motion steadily gnawing and chewing away the sides of the mountain. The glaciers move downward, it is true, but these rivers of ice appear to be making no headway down the valleys. The exposure of the snout to the warm winds and sun causes great chunks to drop off as fast or even faster than the body travels.

These vast tentacles of ice gradually are destroying the mountain. They have been biting away for centuries, and they will continue to do so for eons to come, but some day, scientists believe, this vast pinnacle will be lowered with the plain. The glaciers are cutting deeper and deeper into the sides of the peak, chewing at its very heart. Upon three sides the ice octopus has ground out great amphitheaters. Its work of destruction is accelerated by the loose formation of the mountain, which is covered with a mass of conglomerates belched up by the volcano. There is only an occasional strata of solid volcanic rock.

Flowers and Ice Contrast

In glowing contrast to this marvelous spectacle of ice are the gardens of wild flowers surrounding the glaciers, pushing up the giant slopes wherever the rock and ice will permit. These flowery spots are called parks, principal among which are Paradise, Spray, St. Andrew's, Indian Henry's Hunting Ground and Summerland. Above the timberline there is a zone of gorgeous flowers 50 miles in circuit and nearly 2 miles wide, a veritable carpet of posies on the mountainside. This gigantic wreath includes such beautiful flowers as daisies, anemones, larkspurs, columbine and erethoniums. Then, too, there are other plants of great splendor.

Completely hiding the lower elevations of the park are vast areas of fir, cedar, hemlock, alder, maple, cottonwood and spruce, which are to be found at their greatest size at the 4,000-foot level and lower. While these giants of the forest grow in altitudes as high as 6,000 feet, they are smaller in size than those growing below.

The motorist's key to this wonderland of nature is by way of the magnificent highway, paved one-third of its length,

that reaches out from Tacoma. Connecting at Tacoma with this scenic route is the Pacific highway, the main trunk route down the western coast of the United States, so it can be seen that the park readily is accessible to the entire state. Leaving Tacoma the road threads a picturesque gravelly prairie for 30 miles, ascends the beautiful canyon road, crosses the Ohop valley, leads to the brink of Nisqually canyon, plunges through dense virgin forests and reaches Longmire Springs, the tourist's chief rendezvous. This point is a little more than 100 miles from Seattle and about 65 miles from Tacoma. The elevation here is 2,761 feet.

From Longmire Springs a splendid government-built road winds and switches forth and back, passing the snout of Nisqually glacier, a real, live mountain of ice that thrills the tourist with its magnificence. This marvel of nature, which is less than 1,000 feet from the road, in the bottom of a vast ground-out valley, is 12 miles from Longmire Springs, and the elevation is 3,908 feet.

Continuing up the mountainside, the road rounds Ricksecker's Point, from which promontory one is entranced by the

panoramic view, one most wonderful to behold—impressive Mount Rainier rising immeasurably behind the timber-clad foothills; Nisqually glacier glistening under the sun while it grinds away into the heart of the mountain; far down the canyon the ribbon-like Nisqually river wends its way, while in the far distance looms up on Oregon soil, Mount Hood, its cone-shaped, symmetrical summit in marked contrast to the truncated summit of Rainier, chief and patriarch of the Cascade range.

This government highway is a monument to the engineering skill of Eugene Ricksecker, United States assistant engineer in charge of the work. Up around the face of Gap Point the magnificent driveway leads, and there are places where a step over the retaining wall would mean a drop of 1,000 feet into the river below, but although thousands of cars traversed this road during the 1915 season, and it was the first time that motors were permitted to proceed beyond Nisqually glacier, not a single accident occurred, truly a mark of credit to motorists for obedience to the strict government rules for the safety of the road.

Answers to Inquiries for Route Information

DeWitt, Ark.-Louisville, Ky.

DEWITT, Ark.—Editor Motor Age—Kindly give me the best route from DeWitt, Ark., to Louisville, Ky.—J. M. Lowe.

Drive to Hazen then go east to Forrest City; then 48 miles through Marion and Mound City to Memphis, Tenn. Now drive through Somerville, Jackson, Huntington, Waverly and Dickson to Nashville.

From Nashville it is 192 miles to Louisville, Ky., through Gallatin, Scottsville, Glasgow, Bear Wallow, Buffalo, New Haven, Bardstown and Mt. Washington.

Kenosha, Wis.-Cascade, Ia.

Kenosha, Wis.—Editor Motor Age—Kindly give me the best route from Kenosha, Wis., to Cascade, Ia.—James Murphy.

Drive 32 miles to Lake Geneva over gravel or good dirt and 54 miles via Harvard, Ill., and Belvidere to Rockford, Ill. Now go 42 miles to Dixon, Ill., west 43 miles through Sterling and Morrison to Clinton, Ia. Go north 42 miles through Charlotte and Maquoketa to Fulton, Ia., and at this point make local inquiry as to balance of the route.

Springerville, Ariz.—Editor Motor Age—It has been some time since we advised you regarding road conditions in this section of Arizona. We wish to state that, excepting a storm which we had about a week ago, climatic conditions as well as road conditions have never been better. Of course, a good many of the roads are not at all improved over what they were 6 months ago, but we can say that long stretches of our roads have been well graded and as soon as the surface becomes hardened will be in excellent condition.

Insofar as we are concerned here, unless some unforeseen storm should set in, we see no reason why tourists cannot travel through this section and western New Mexico up to the middle of December, at least, and possibly later. In 1913 tourists made it through here until nearly the first of February. Last year the last car passed through about January 1. This season, which has been altogether different from last and which compares very much with other falls, which pre-

ceded an open winter, causes us to be quite enthusiastic over prospects.—Becker Mercantile Co.

Spirit Lake, Ia.-Woodville, Miss.

Spirit Lake, Ia.—Editor Motor Age—Kindly give the best and shortest route from Spirit Lake, Ia., to Woodville, Miss.—C. E. Hartman.

Leaving Spirit Lake, route via Okoboji, Milford, Spencer, Sioux Rapids, Marathon, Laurens, Havelock, Rolfe, Gilmore, to Fort Dodge, 114 miles over level country, then 92 miles via Roberts Station, Dayton, Ogden, Boone, Madrid, to Des Moines, Ia., and 193 miles via Prairie City, Pella, Oskaloosa, Harper, Washington, then to Swedesburg, Mt. Pleasant, Salem, Donaldson, Charleston and Keokuk.

From Keokuk, drive south via Hamilton, Sutter, Marcelline, Ursa, to Quincy, then to St. Louis, via Marblehead, Shepherd, Ill., Hannibal, Mo., New London, Frankford, Louisiana, Rocky Ford, Prairieville, Moscow Mills, Wentzville, Cottleville, St. Charles, St. Louis, 151 miles, then south through Maxville, Antonia, Hillsboro, Victoria, De Soto, Flat River, Farmington, Weingarten, to Ste. Genevieve.

It is a run of 286 miles to Forrest City, Ark., passing through Perryville, Uniontown, Appleton, Jackson, Cape Girardeau, Dutchtown, Allenville, Aquilla, Bloomfield, Dexter, Mo., Campbell, Ark., Piggott, Rector, Marmaduke, Paragould, Brookland, Jonesboro, Greenfield, Harrisburg, Whitehall, Wynne, Forrest City, then east 48 miles via Madison, Mound City, Ark., crossing over Mississippi river to Memphis, Tenn., where local inquiry should be made as to road conditions between Memphis and Magnolia, Miss., via Lynchburg, Miss., Lake Cormorant, Clacks, Robinsonville, Hollywood, Tunica, Clayton, Dundee, Rich, Coahoma, Tutwiler, Sumner, Schlater, Greenwood, Lexington, Franklin, Goodman, Pickens, Canton, Jackson, Terry, Crystal Springs, Hazlehurst, Beauregard Station, Brookhaven, to Magnolia. It will be necessary to make local inquiry as to a road between Magnolia and Woodville, Miss.

at its base, it was a power to guide them. The vast pile of snow was held in superstitious reverence by the native red skins. It was to them what the sun, the wind, great rivers and waterfalls represented, Deified superlative manifestations of nature to other primitive peoples. They feared Mount Rainier's anger, seen in the storms that raged about its snow-crowned dome, the thunder of its avalanches and the volcanic flashes of which their traditions told.

Above snow-line on Mount Rainier was sacred ground. No one dared proceed beyond for fear of the mystery and peril that they saw in the clouds. Sluiskin, whose Indian name is mingled with the history of the mountain, abandoned Stevens and Van Trump at the snow-line in their first ascent of the peak in 1870. His keenness for the white man's money was not even strong enough to urge him farther. He wailed their certain death when, ignoring his pitiful warnings, they left him and defied the wrath of the "Mountain that was God." They succeeded in their climb, but Indians dared not tread what they considered sacred soil.

Park Covers 100 Square Miles

Mount Rainier covers 100 square miles, or about one-third of Rainier National park, which is 324 square miles in extent. It rises about 10,000 feet above its immediate base.

Unlike many of the lofty, symmetrical, cone-shaped peaks in the United States, the summit of Mount Rainier is a broadly truncated mass, broken and torn by the ice of centuries. Judging from the steep inclination of the lava and cinder layers visible in its flanks, Mount Rainier at one time attained a height of at least 16,000 feet. There came a mighty explosion that blew the mountain's head off, lopped about 2,000 feet from its dome. The peak was left beheaded, with a capacious hollow crater surrounded by a jagged rim. This great cavity, which measured about 3 miles across from north to south, was filled with two small cinder cones. Successive feeble eruptions added to their height until at last they formed a low, rounded dome, eternally snow-covered and swept by furious winds. This eminence now constitutes the actual summit of the mountain. The higher portions of the old crater rim tower to within several hundred feet of the summit. Peak Success attains an elevation of 14,150 feet, while Liberty Cap boasts of a height of 14,112 feet.

There has been much discussion concerning the real altitude of Mount Rainier, but the findings of the United States Geological Survey in 1913 are now considered accurate; namely, 14,



A side glimpse of Nisqually glacier. The men, from left to right, are Stephen T. Mather, assistant secretary of interior; D. L. Reaburn, supervisor of Rainier park, and R. P. Marshall, U. S. chief geographer

408 feet. Greater exactness of determination scarcely is practicable, as the summit of the peak varies with the seasons from year to year. This crowning snow mound, which was once supposed to be the highest point in the United States and was credited at one time with an elevation of 14,526 feet, still bears the proud name of Columbia Crest. It essentially is a huge snowdrift heaped by furious westerly winds.

The Icy Cloak Spectacular

The most spectacular of all the wonders that are in store for the tourist and nature lover in this alpine area is the gigantic mantle of ice that cloaks the dome and sides of Mount Rainier. Covering between 45 and 50 square miles, it is one of the largest glacier systems in the world radiating from any single peak. Like a Cyclopean octopus, it reaches with mighty arms from the summit to end in rivers below. It is without doubt the most extensive ice area on the continent, excepting Alaska, and is declared by scientists to outrank that of any mountain in Europe, where Americans heretofore have traveled thousands of miles and spent millions of dollars to view scenery that is surpassed in their own country.

Twelve glaciers of primary importance, varying in length from 3 to 8 miles, extend down the sides of the famed peak, while there are nearly as many smaller ice streams which are born of the snows in rock pockets or cirques, ice-sculptured bowls of great dimensions and ever-increasing depth, from which they emerge the glistening armor of the huge volcano. Great and small, these glaciers possess many of the characteristics of rivers of water, roaring at times over precipices like waterfalls; rippling and tumbling down rocky slopes—veritable noisy cascades, rushing smoothly upon hidden rocks to foam, brooklike, over its lower edges.

Glacial Origin in Immaculate Snow

Glaciers all originate in immaculate snow, whether it be in one of the numerous cirques or at the summit. A quarter of a mile or so below, the glacier attains sufficient density and weight to acquire movement. Here looking down into a crevasse, one sees nothing but clean snow, piled in layers slightly compacted, and loosely granular snow. Gradually, as the current sweeps along, it compacts under pressure with the surface meltings into hard, dense ice of blue shade.

Most noted of Mount Rainier's glaciers are Cowlitz, Ingham, White, Winthrop, Carbon, South Mowich, Puyallup, North Tahoma, South Tahoma, Kautz and Nisqually. Of lesser importance, but nevertheless mighty are Stevens, Paradise, Fry-



Women mountain climbers on the actual summit of Mt. Rainier



The Motor Car Repair Shop



Hints on Putting the Car Away for the Winter

It is now getting close to the time when many motorists will begin to think of putting their cars in storage for the winter, and it therefore seems timely to mention some of the things to remember when doing it. There are several matters to attend to in order that the machine will be in best of shape when it is taken out after its several months of rest, and if they are not given attention, the careless one is apt to regret it when the spring winds begin to blow again.

Some of us who live in the cities are not troubled by winter's grip of the country, for we can run our cars all through the icy weather, thanks to the street cleaning department and the heavy traffic. But to the man who lives in the country or who resides in those sections where the winter is long and severe and the snow is deep, the driving of his car after November or early December has slipped by not always is a pleasure.

There are several vital parts of the car which must be specially seen to when taking the car out of commission. Of these the storage battery, the tires and the cooling system are the most important.

Laying Up the Battery

The first thing to do when taking the battery out of commission for several months is to disconnect the wires leading to it. This is a precaution which will keep it from discharging, as any slight leak in the wiring would discharge the battery, and it is very detrimental to let it remain for any length of time in a discharged condition. But be very careful never to run the motor with the battery disconnected in this way. This will quickly burn out the electric generator if you run it on open circuit.

During the time when the car is not being used, the battery should be charged periodically either by running the engine and thus sending current to it from the car's generator, or by charging from an outside current supply. In either case, the job must be done about every 60 days for best results with the battery.

Before putting the car away, it is best to see that there is plenty of water submerging the plates of each cell. Having added the water, it is advisable to drive the car for a mile or so to mix the newly added water with the electrolyte, thus making sure that it is in good electrolytic condition throughout. The solution should be at a gravity of about 1,280 to 1,300 when the car is put away, which insures that it will not freeze under any conditions.

If the solution does not show a gravity of this amount, then it is best to charge

it until it does, before abandoning the battery for any long period. Most experts advise charging until the gravity of all the cells fails to rise further for a period of 2 hours.

If possible, a stored battery should be put in a dry place that is not very dusty. Dampness will foster corrosion, and besides is not good for any part of the car. Do not put the battery in a hot place either. It should be cool.

Be Fair to the Tires

Spring is usually the time when you see most of the cars drawn up at the side of the road with tire trouble. Whenever you see an owner in this predicament then you can put it down as a certainty that he did not take the proper care of his pneumatics when he had his car out of commission. If he let the car stand in a damp place, if sun was allowed to beat in on the tires, or if the car weight was left on them during all the period of inactivity, then it is no wonder the trouble came.

With these results of carelessness before us, let us now put the car away with due respect for the tires. First, lift the car off its tires by jacks. If allowed to rest on one spot on the tires for a long period, the part in contact with the floor is apt to be flattened, and the fabric at this point stretched out of shape. This weakens this particular section of the tire and it is apt to give trouble later. Then let most of the air out of them so as to relieve all strain. Some motorists favor even more careful storing than this. They take the tires from the rims entirely and after wrapping them in dry cloths, store them in a dry place where light and dampness are excluded. This is most highly recommended, although jacking up the car is nearly as good.

In storing inner tubes, it is best to inflate them a little so as to remove all wrinkles or creases. If they are allowed to remain in folded or crumpled condition, time will get in its work. The creases and folds will be places of weakness. Nothing could be better for them than to wrap them in cloths or papers too, after having inflated them slightly.

Some of these pointers may seem foolish and too much trouble. Nothing is too great a trouble if it will enable you to have tires that are as good in the spring as they were in the fall. It is a paying investment in satisfaction and money to make sure that your tires will not blow out or leak the first time you make a run of any distance next spring.

If you take the tires off the rims, paint the rims with graphite so as to rid them of any rust that may have accumulated,

or to prevent any from forming while the rims are exposed. It is easier to prevent rust than to remove it. Rust is a great enemy of rubber.

Drain Water and Oil

Having seen to the tires, next drain the cooling system completely dry. Run the engine for a minute or two to make sure that the system is fully rid of water, thus eliminating any chance for freezing or rust of piping. Also drain all oil out of the engine. This will prevent it from gumming the pipes and oil pan or reservoir due to standing for a long time inactive.

Put Up the Top

Standing for a long period in a folded condition, the top is apt to get creased and damaged. So when storing the car it is advisable to put the top up, thus allowing it to remain in smooth shape, against cracking or creasing of the material. Besides this, the top will catch much of the dust which would ordinarily settle on the upholstery. Still better for the upholstery would be a sheet or tarpaulin spread over it. This is especially true if the upholstery is cloth or any cloth preparation. Dust of several months is not easy to get out of the weave, and it never does any fabric any good. Even in the folds of the leather it is hard to remove.

Drain the Gasoline

Do not forget to take all the gasoline out of the tank. If left in the car, it is apt to leak out somewhere and gasoline vapors are a bad thing to have around. Having taken all of it out of the tank, the motor should be run until it is all gone. This could be done at the same time as the water is drained. Lack of gasoline is a good thing, too, to prevent the engine being run if you have disconnected the battery, and to prevent hurting the motor without water or oil in it.

Steering Gear Precautions

No part of the car is more responsible for your safety than the steering gear, steering connections, etc. Never allow any rattling to get into these parts, for such rattling is a sure sign of looseness in the connections somewhere. It tends to excessive wear of the parts affected, and such cannot be neglected. In the steering wheel there should not be over a quarter of a turn play. There must be some play, so that steering will be possible, otherwise each little jar of the road would be felt by the driver. But this play has its limits and it is almost as hard to drive a machine with excessive play in the wheel as it is one set too close. Either is dangerous, for the utmost ease of control is essential.



The Readers' Clearing House



DIFFERENTIAL IS NOISY

Detail Plan of Consecutive Steps for Locating Trouble

VICTORIA, B. C.—Editor Motor Age—The differential on my Hudson 6-40 is very noisy. It apparently was all right until taken apart by a mechanic, who I think upset the adjustment of the gears. Kindly tell me how to adjust the gears on this car.

2—What starting system is used on the Packard twin six and could Motor Age illustrate by diagram the wiring of same?—Victorian.

1—A sectional view of the Hudson rear axle is shown in Fig. 1. Before starting to make any adjustments, remove the inspection plug on the left side of the differential carrier. Examine the back faces of pinion and ring gear to make sure that the ends of the teeth of both are flush. The adjustment of the pinion for end play is done first by removing the pinion adjustment lock, which is held in place by two bolts on top of the carrier. Take these out and then the lock can be released from the adjusting nuts. End play in the pinion shaft is taken care of by turning the inner nut toward the left when looking at the axle from the front. This is the front bearing adjustment. The outer nut, which is for the rear pinion shaft bearing adjustment should be held against turning when adjusting the front bearing. The play should be taken up between the bearings until there is no end motion, but be careful not to bind the shaft or make it turn hard. Next line up the slots in both the adjusting nuts, and if it is necessary to bring the pinion deeper into mesh with the ring gear, turn both nuts to the right. Turning them together to the left will withdraw the pinion from the ring gear. The proper amount of backlash between teeth of ring gear and pinion is from .006 to .008 inch. Having secured the desired adjustment, lock the adjusting nuts in place.

So much for the adjustment of pinion and its shaft. If the pinion is flush with with the ring gear and there is still too much play, or not enough, then the ring gear can be adjusted either in or out to take care of it. First take off the cover plate at the rear of the housing, and then remove the differential bearing adjustment locks. In order to turn the adjusting nuts readily, the bolts holding the bearing caps in place should be loosened a little. Do not loosen very much as the thread on these caps will get cross-threaded if the bolts are backed out too much. To move the ring gear toward the right, back off the right adjusting nut one or two notches at a time, and take up on the left adjusting nut the same number. To move the gear in the opposite direction, reverse the procedure. These adjusting nuts also are provided to take any side play out of the bearings. Be very careful against binding, but be sure there is no play. Having se-

cured the best possible adjustment, tighten the bearing caps, and put the adjusting nut locks back in place. If the work has been done correctly, there should be no noise in the axle.

2—The Packard twin six uses the Packard-Bijur lighting and starting system, and Delco ignition. The complete wiring diagram of this car was published on page 37 of the October 14, 1915, issue of Motor Age.

HAS SOME TROUBLE WITH LIGHTS

Are Dim and Will Not Brighten When Engine Is Accelerated

Morrill, Kan.—Editor Motor Age—I have a Ford equipped with an Atwater-Kent ignition system, using the magneto for lighting. The lights are very dim and will not brighten up with the engine speed. Have put in new magnets, new wiring and new electrode and bulbs, still the lights are dim. What is the cause of this dimness?—E. W. Davis.

Waste or dirt of some kind probably has accumulated under the contact spring, which is held in place by the binding post on top of the crankcase cover. Take out the three screws which hold this binding post in place, then you can remove the post and spring. After cleaning off any foreign matter and replacing the binding post, the system should work satisfactorily, granting that the connections are good, the magnets strong, and all parts of the system in good working order. Possibly you have a loose connection that you have not discovered. It is best to check all of this up carefully.

WANTS CARBURETER INFORMATION

Needs Richer Mixture for Starting, but Leaner When Engine Gets Running

Brooklyn, N. Y.—Editor Motor Age—I have a Maxwell 1915 model with a Maxwell carbureter. This carbureter has an adjustable needle valve leading into the mixing chamber, but the air supply has no adjustment, beyond a butterfly for choking when the engine is cold. Is it not true that a lean mixture is best for speeding, and a richer one best for slow traveling?

2—If the carbureter is adjusted for a rich mixture when driving in traffic is contemplated, the engine will overheat as soon as it is speeded up and vice versa. If a lean mixture is adjusted the engine often will stop dead as soon as the clutch is thrown out and the throttle closed down. There is a dash adjustment connecting with the needle valve, but the latter seems to me to be too delicate a thing to be working back and forth too much.

3—Can Motor Age give any advice as to

how the air may be adjusted so that the carbureter may be set and left for the day?

4—Would a new carbureter with adjustable air valves be better for my car?—H. H. A.

1—The early 1915 Maxwell 25's had Kingston carbureters, and later ones were fitted with a K-D carbureter. If you will state which of these your car has, Motor Age can tell you how to adjust it properly.

2—The carbureter is capable of adjustment for both high speed running and low speed work. Your trouble is due to maladjustment.

3—Tell us the make of the carbureter. Ordinarily, a carbureter must be given a richer mixture for starting, hence the air should be diminished. But later after the engine gets to running normally, the air can be increased, usually. It should not be necessary continually to give attention to the dash adjustment.

4—Not necessarily. Your carbureter is all right once you get it adjusted, and then leave it alone.

FITTING MAGNETO TO OLD CAR

How to Attach High-Tension Ignition Device to 1906 Model Franklin

Superton, Neb.—Editor Motor Age—I have a Franklin 1906 model, small four which runs fine as it has been kept in good shape, but it has dry cell ignition which is expensive. What would Motor Age suggest for a change? Could a magneto be attached? If so, what kind?—C. Teachont.

It is suggested that you attach a DU-4 fixed-ignition type of Bosch magneto with twelve-tooth sprocket on the camshaft in place of the timer, and six-tooth sprocket on magneto armature shaft. The magneto is bolted to a special bracket which is bolted in turn to the left front corner of the engine base and immediately behind the front cheek piece where it projects to the left. These parts are carried in stock by the Franklin company. The chain which drives the magneto is a $\frac{3}{8}$ -inch standard bicycle chain.

Removing Motor to Re-Babbitt Bearings

Winchester, Ill.—Editor Motor Age—How can the bearings on the camshaft of a 1914 Maxwell 25 be taken up? Does the motor have to be removed from the frame to re-babbit the main bearings?—W. W.

You cannot take up the bearings on this camshaft. If they are worn, they must be

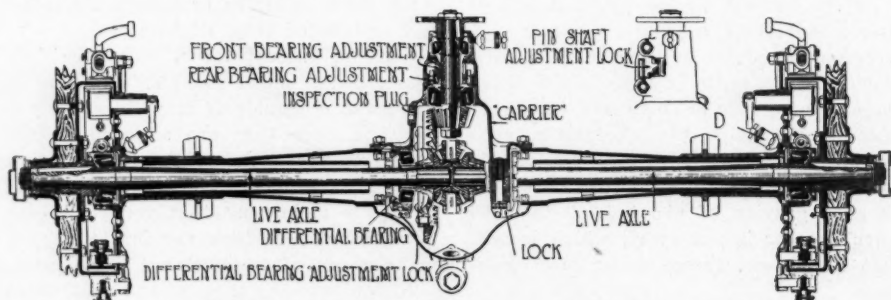


FIG. 1—SECTION OF HUDSON REAR AXLE SHOWING THE ADJUSTMENTS

View gives location of the component parts making up the rear axle of a Hudson 6-40

relined. The engine must be taken from the chassis to remove the crankshaft. The crankcase is of barrel form, and the shaft is taken out through the end.

RIGHT-DRIVE USED ON RACING CARS No Special Reason Therefor, but Some Drivers Prefer It

Hillsboro, Kan.—Editor Motor Age—Why are most of the racing cars fitted with right-hand steering control?

2—Does Motor Age consider cantilever springs satisfactory for racing purposes; that is, cantilever springs such as used front and rear on the Saxon models?—S. Ritter von Malicki.

1—There is no special reason for right steering of racing cars. You may have received the impression that it was the rule to have right steering from the fact that foreign cars have it. The standard steering of all foreign cars is right, hence European racing cars have right drive. There are some race drivers, however, who seem to prefer right drive. Joe Dawson, for instance, likes to see his right front tire, so he always requires a right drive car.

2—There is no reason why properly designed cantilever springs are not as satisfactory for racing purposes as any other.

MAGNETO GENERATES WEAK SPARK Manipulation Foreign to the Remy Unit— Magnets May Be Weak

Utica, Miss.—Editor Motor Age—I have a type S Remy magneto on a Winton C car and cannot get enough spark either from dry batteries or magneto to start with cranking. Would it be advisable to speed magneto double speed and use a timer instead of the distributor on the magneto?

2—What is the proper ratio for the length of connecting rods as to stroke?

3—Does Motor Age know the formula for gear bronze, or is this a secret with manufacturers?

4—What is the bore and stroke of the new model White, eight-cylinder truck?

5—Where can I get a reliable treatise on bronze and alloys?—E. C. Richards.

1—No. The magneto and its drive were not designed for any such manipulation. It is most likely that through some cause or other your magneto magnets have been weakened. It would be best to take the magneto or send it to the nearest Remy service station and have it overhauled.

2—About 2 to 1 in average practice.

3—Gear bronze that is most generally used is an alloy containing 88 to 90 per cent copper and 12 to 10 per cent tin. There is no standard gear bronze adopted, but the above is in quite common use. Of course, manufacturers sometimes have their own special gear bronze formula, but the 88-12 alloy has proven very successful.

4—Motor Age knows of no such machine. The White company has never put any form of eight on the market.

5—Write to John Wiley & Sons, publishers, 43-45 East Nineteenth street, New York. This company publishes several books dealing with bronze and brass alloys. It publishes a work by Thurston entitled a Treatise on Brasses, Bronzes and Other Alloys and Their Constituents.

PUTTING WATER INTO CYLINDER How Much to Use Matter of Experiment— Reduction of Carbon

Rogers, Ark.—Editor Motor Age—What is the temperature inside of a motor car cylinder at the time of the explosion?

2—What would happen if a little water were forced in on the explosion?

3—How much water could be utilized in an explosion of a cylinder with 3½-inch bore?

4—Will that moisture or steam make any more power, and will it keep out the carbon to a certain extent?—T. S. McNeil.

1—Usually from 400 to 500 degrees Fahrenheit.

2—The water would be turned into steam.

3—It is impossible to say. Experiment will tell you.

4—Some think that a small quantity of moisture increases the power of the explosion. It is believed this is especially true with low-grade fuels. Yes, it will prevent the formation of carbon to some extent.

Location of Cutout

German Valley, Ill.—Editor Motor Age—Please state if, in your opinion, a cutout is beneficial and the reason for same. What make of cutout would you recommend? Is it true that a muffler is of assistance to the motor? I wish a cutout which will give a good, snappy report. Where is the best location for the cutout? Should it be as near the motor as possible or should it be near the muffler?—P. M. Miller, M. D.

With most cars that have been run for some time, the muffler has become clogged

with carbon to a certain extent. This prevents the rapid exit and expansion of the exhaust gas, which in turn causes back pressure. Back pressure reduces the effective pressure of the explosion and consequently cuts down the power of the motor. Obviously, when the gas is permitted to exhaust directly to the air through the cutout the back pressure is minimized and the power thus increased.

With certain properly designed types of mufflers, tests have shown actual decrease in power when the muffler and exhaust pipe were removed. The difference in this case is attributed to an ejector effect.

Both the production of a loud, snappy report and the reduction of back pressure depend on the rapid expansion of the exhaust gas. That means, open the exhaust pipe as wide as possible as close to the motor as possible and with as direct a shoot from the valves as possible.

SIXTEEN - VALVE DUESENBERGS Seeks Information on Motors and Speed of Haynes Light Six

Augusta, Kan.—Editor Motor Age—Were any of the Deussenbergs, which started in the New York speedway races, sixteen-valve motors?

2—Would a sixteen-valve motor, similar to the Wisconsin motor, be suitable for a roadster? Could it be throttled down to 10 or 12 m. p. h.?

3—How fast could a Haynes Light Six, 3½ by 5 and geared 4 to 1, run? Can this car run 60 m. p. h. with a gear of 4 to 1?

4—Can one increase the size of the carburetor on the same manifold and same port holes and increase the speed, or would it load up?—G. H. Hamilton.

1—Yes.

2—Yes.

3—The Haynes Company claim 60 m. p. h. for the light six on a gear ratio of 4 to 1.

4—This depends on the motor. Usually it is necessary to increase the manifold when the carburetor size is increased to get best results.

Adjusting Marvel Carburetor

Clearwater, Neb.—Editor Motor Age—My 1916 model D-42 Buick is equipped with a Marvel carburetor. I can set the carburetor to work on high speed, but it will not throttle down at low speed without missing. When I adjust the carburetor to throttle down on low speeds then it will not work on high speed without missing. Is it possible to adjust it so that it will work at both high and low speeds? The plugs are in good condition and the ignition is perfect. If it is impossible to adjust this carburetor to work properly, what make of carburetor would Motor Age recommend?—A. E. Phillips.

It is quite possible to adjust this carburetor to work satisfactorily at both high and low speed. The construction and adjustment of the Marvel carburetor on the present Buicks is described fully in the Clearing House section of Motor Age of October 14, 1915, on pages 36 and 37.

Ford Has Mysterious Knock

Catawba, O.—Editor Motor Age—I have a 1915 Ford which has a queer knock when the throttle is at a certain place on the quadrant, about the fifth notch. The engine begins to knock louder when on a pull. If it is left at this place very long, a rattling sound will start in the motor. Since it has been cleaned of carbon and the valves are ground, the sound is louder. I think it is a loose piston in the first cylinder, as the plug has more oil on it than the rest. Kindly give your opinion.—R. W. Tavenner.

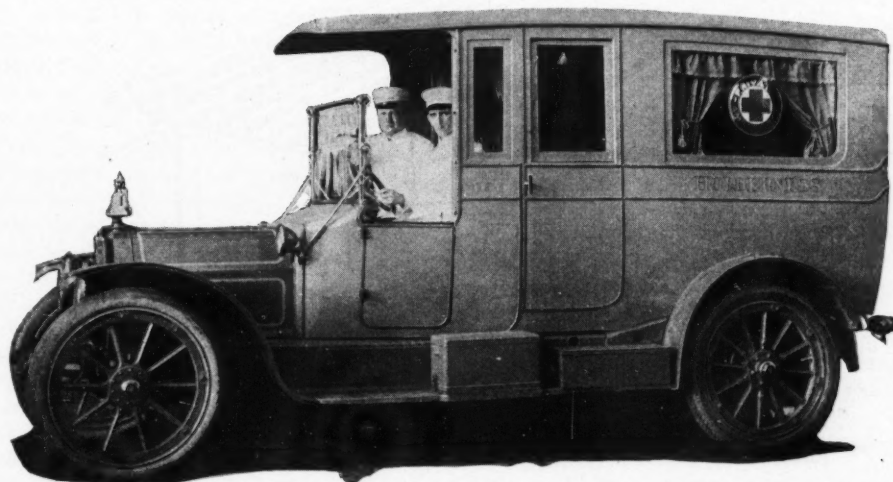


FIG. 2—AMBULANCE CONSTRUCTED BY W. R. CRAWFORD, PINE BLUFF, ARK.
Chassis of a 1912 touring car on which new body was built from front door back

It is most probable that you have a loose connecting-rod bearing or one of the main bearings needs adjustment. The fact that the knock gets louder as the pull increases would strengthen that view. Motor Age suggests that the motor be pulled down and the bearings all adjusted.

It is a common fault of Fords that the first cylinder gets too much oil if the operator is in the habit of giving the motor an overabundance of oil. Care should be taken that the level in the flywheel reservoir does not get up to the upper trycock, but it should be just above the lower one at all times.

DESIGNS MOTOR SLEEPING CAR Equipment Used Proves Satisfactory on Cross-Country Trip

West Pullman, Ill.—Editor Motor Age—I have read with much interest the various articles in Motor Age from time to time on equipping a car for cross-country touring, and now possibly my summer touring experiences will be of interest to fellow motorists.

On August 1 my wife and I left West Pullman for Wichita, Kan., following the Lincoln Highway to Omaha, Old Trails to Lincoln, then to Maryville, Kan., and the Meridian road to Wichita. Our return trip was by way of St. Joseph, Mo., Atlantic, Des Moines, Ames and the Lincoln highway to West Pullman. We were out 23 days and 22 nights, sleeping in the car in all kinds of August weather. Total expense on the road for the two, including meals, gasoline, oil, etc., was \$51.

We did not have a puncture or car troubles of any nature. I make it a practice not to drive over 20 m. p. h., even on the best of roads, and 100 miles was the limit for a day's run. At six o'clock our day's run was completed, regardless of the number of miles made.

I made a sleeping rack of boards $2\frac{1}{4}$ by $\frac{3}{4}$ inches with slats $\frac{3}{8}$ by 3 inches. See Fig. 3. The rack is hinged so as to fold up and is carried on the running board. Weight complete about 30 pounds. The material, including hardware and paint, cost \$7. I was 3 days building the rack, perfecting the original design as I worked on it. My object was to secure a full-sized comfortable bed, and I succeeded, and it was found to be easier and more comfortable than the lower berth of a Pullman.

The rack or bed does not rest on the cushions, but on supporting brackets, and it is not necessary to remove anything from the car to set it up. The car was screened with curtains and mosquito cloth, $1\frac{1}{2}$ yards wide, was placed around the car, being held in place at the corners of the car by a snap spring clothes pin.

ADVANCING LEVER CUTS OFF SPARK

Weak Magnets or Coil, Poorly Set Distributer, Bad Timing, Are Among Causes

Keenes, Ill.—Editor Motor Age—Does the Allen car model 37 use any current from the battery for ignition?

2.—What is wrong when advance of spark lever to the top of the sector cuts off the current to plugs?

3.—What was the brake horsepower of the Buick 32?

4.—Why will one headlight on a Hupmobile 32 burn out and the other does not? Are both not in the same circuit?

5.—Should all starter and motor armatures have an air space around them and not touch as the armature in the magneto?

6.—Should the armature be shellaced?

7.—What is the white substance placed around the coil in the Remy electrifier?—C. R. Keen.

1.—Unless your car is equipped with a magneto, the ignition current comes from the battery.

2.—This might be due to several causes. If the car has magneto ignition, it might be due to weak magnets, or it might be caused by a weak coil whether you have magneto or battery ignition. The distributor might be out of time with the specifications of the engine. Possibly the gears are too far advanced when the spark lever is retarded or in normal position, so that when the lever is brought way up

on the quadrant it puts the ignition entirely off. However, it is seldom or ever that the running conditions require the spark lever being brought to the top of the quadrant, or to the extreme opposite end to the position it is in when the spark is fully retarded. Usually, when the spark lever is fully retarded at the bottom of the quadrant, the best running position is three-quarters of the way up.

3.—This car has a $3\frac{3}{4}$ by $3\frac{3}{4}$ motor, and the N. A. C. C. rating is 22.5 horsepower. The car will probably develop a little over 30 horsepower on the brake when in good condition.

4.—The lights are connected in parallel. If connected in series, and one burned out the other would not light. Possibly you have a loose connection in the wiring of this light.

5.—Magneto armatures do not touch anything. Neither do those of motors or generators. They could not operate if they did.

6.—The windings are usually coated with a heat-resisting and insulating preparation.

7.—Probably you refer to the paraffin preparation that is put on the coil.

TIMING VALVES OF 1912 REGAL Detailed Instructions for Setting the Valves and Magneto for the Amateur

Roselle, N. J.—Editor Motor Age—Kindly give me the valve timing and magneto timing of a 1912 model 30 Regal touring car. I have had the motor down on car and since then it fires through the carbureter. I have tried different adjustments but with no success.—Charles Pfaff.

The magneto should be set so that the spark will occur at each spark plug just at the same instant the corresponding piston reaches the uppermost point of its compression stroke with spark lever on the steering wheel quadrant in its full retarded position. You can test the spark

to determine whether or not it is occurring at the correct time by the following method: First place the spark lever in its full retarded position and place the ignition switch on the battery side. Then unfasten the wire from No. 1 spark plug and hold the end of the wire about $\frac{1}{2}$ inch away from the brass nut on the spark plug while someone slowly cranks the engine over the compression stroke of the No. 1 cylinder. Have him stop cranking at the instant the spark leaps from the wire to the plug and then see if the 1-4 center line on the face of the flywheel is up at the top of the flywheel in line with the center of the cylinders. If you find that the 1-4 center line is not quite up to this position this will show that the magneto is timed early; but if the center line has moved past this position, this will show that the magneto is set late. Any variation less than 1 inch either way will not be enough to cause any difference in the running of the engine, but if the variation exceeds an inch the setting of the magneto should be changed.

To do this, it is necessary to take off the radiator, remove the time gear housing from the front of the engine, and then remove the small timing gear from the end of the magneto shaft. If the magneto is timed early the gear should be replaced on the shaft one tooth removed to the left from its former position, and one tooth to the right if the magneto is timed late. By right and left we mean as you face the engine from the front. A change of one tooth in the position of the gear makes a variation of just about 1 inch on the circumference of the flywheel.

In regard to the valve timing, if you will examine the rim of the flywheel you will find that it has several lines marked on it, and opposite these lines the figures 16, 34, 40, 10 1-4 and 2-3. These lines and figures represent distances or measurements in degrees from the two lines diametrically opposite each other (one marked 1-4 and the other 2-3). These lines indi-

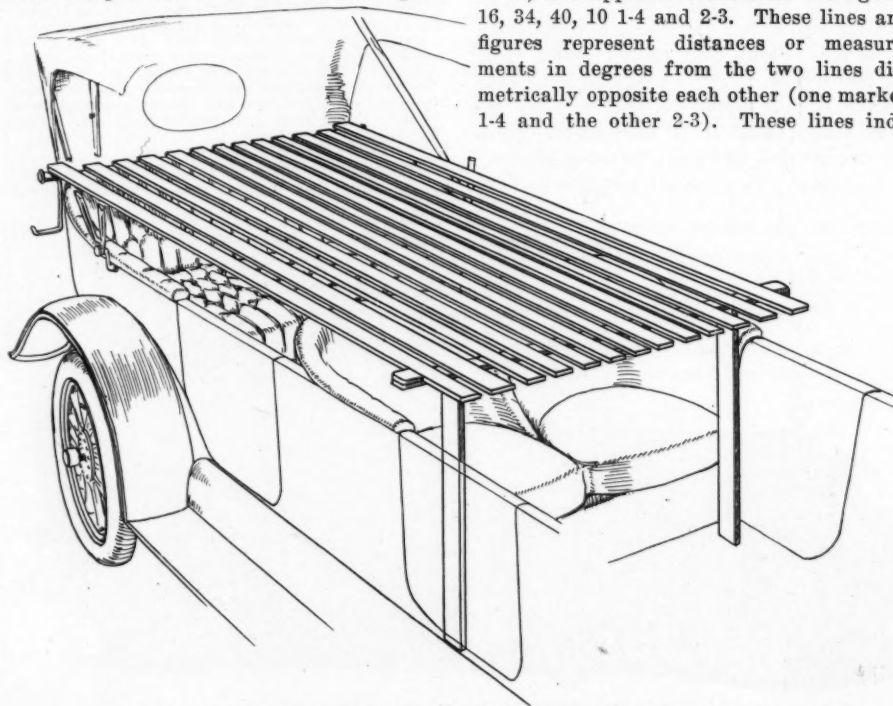


FIG. 3—BED DESIGNED FOR MOTOR CAR
Has slats supported by frame and body back of rear seats

cate the point at which the different valves open and close. When the flywheel is turned so that the line marked 1-4 is up and coincides with the center line of the cylinders, the No. 1 and No. 4 pistons are just at the uppermost point of their stroke or at the upper dead center. When the line marked 2-3 is up in line with the center line of the cylinders, the No. 2 and No. 3 pistons are at upper dead center.

Before proceeding further it would be well for us to explain what is meant by the center line of the cylinder and explain a convenient way for locating this line. The center line of the cylinders is a line that if extended, would pass through the exact center line of each cylinder. To locate a line at the top of the flywheel that will be exactly midway between the center of the cylinder flange stud at the right rear corner of the rear cylinder casting and the center of the stud at the left hand rear corner of the cylinder casting. The distance between the centers of these two studs is $3\frac{3}{4}$ inches, so the line midway between the studs would be $1\frac{1}{2}$ inch over toward the center of the cylinders. When you locate this line, mark same on the rim of the flywheel. Next take a piece of wire from 14 inches to 15 inches in length; fasten one end of the wire under one of the cylinder flange stud nuts at the rear of the cylinder casting, and then bend the wire up to the top of the flywheel and out at right angles to face of the flywheel directly over the line which you have marked on the flywheel rim. This wire, in this position, will indicate the exact center line of the cylinders.

To determine whether or not the valves are timed properly, first open the relief cock on top of the cylinders, then turn the flywheel to the left until the line marked 1-4 is opposite, or rather directly under the center line of the cylinders. At this point the exhaust valve in either No. 1 or No. 4 cylinder should just commence to close. If you find that the exhaust valve in No. 4 cylinder is beginning to close, and you wish to check up the valve in No. 1 cylinder, turn the flywheel around to the left, one complete revolution, until the line 1-4 is again brought under the center line of the cylinders; then continue slowly turning the flywheel about an inch or so to the left until the line marked 10 coincides with the center line of the cylinders. This is the point at which the exhaust valve in the No. 1 cylinder should just seat itself or close. To determine whether or not the valve is seated, see if the tappet or push rod underneath the valve can be turned with the fingers. If the tappet turns freely the valve is seated, and if the tappet is hard to turn, that will show that the valve is still being held slightly open. If this is the case, loosen the lock nut on the tappet screw and turn the screw down until the valve just seats; then turn the lock nut down tight against the tappet.

To check up the timing of the inlet valve in the same cylinder, turn the fly-

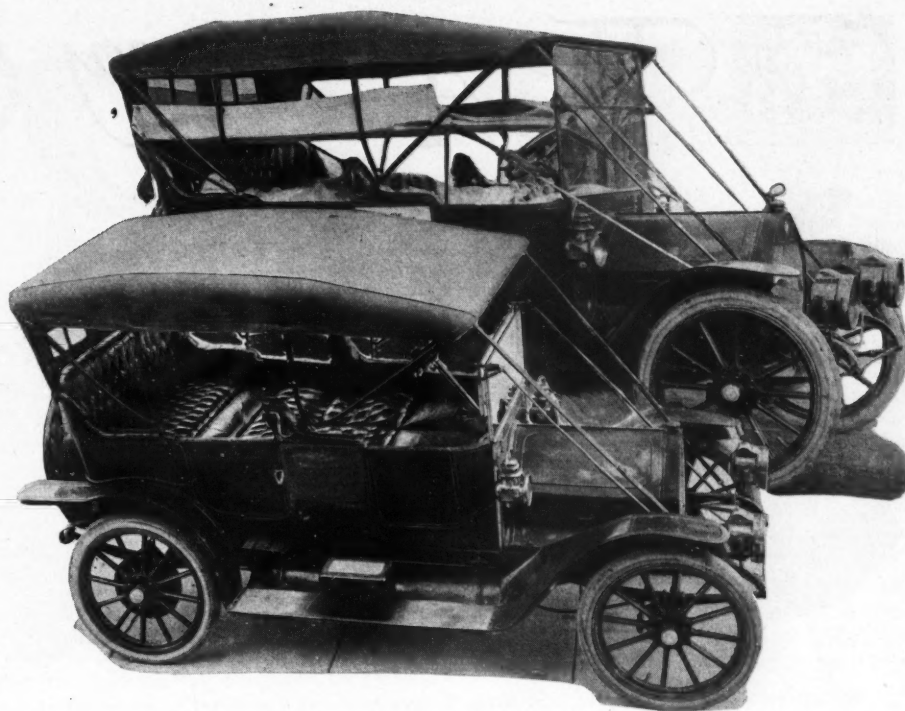


FIG. 4—NOVEL BED ARRANGEMENT FOR TOURING CARS
Upper view shows both berths, while lower gives idea for utilizing seats

wheel $\frac{3}{4}$ inch or so toward the left, until the line marked 16 comes under the center line of the cylinders. At this point, the inlet valve in the No. 1 cylinder should just begin to open. Turn the flywheel a little better than one half turn to the left, stopping when the line marked 34, three lines to the right of the 2-3 center line, comes in line with the center of the cylinders. At this point the inlet valve in the No. 1 cylinder should just close.

To see if the exhaust valve in the No. 1 cylinder opens at the proper time, revolve the flywheel three-fourths of a turn to the left, and stop when the line 40, the first line to the left of the 2-3 center line, comes in line with the center of the cylinders. This is the point where the exhaust valve in No. 1 cylinder should just begin to open. The above completes the timing of cylinder No. 1.

To time cylinder No. 2, turn the flywheel until the line marked 2-3 is in line with the center line of the cylinders. If the exhaust valve in the No. 2 cylinder is closed, turn the flywheel through one complete revolution, until the line 2-3 is up again; the exhaust valve in No. 2 cylinder should then just be starting to close. Proceed now as in timing the No. 1 cylinder.

The No. 4 cylinder is timed from the center line 1-4 and the No. 3 cylinder from the center line 2-3. When the valves are closed there should be clearance between the valve stems and the tappet screws of from .003 to .004 inch. This amount of clearance is necessary to allow the valves to seat tightly.

Squeak in Buick Clutch Brake

Clearwater, Neb.—Editor Motor Age—How may a squeak in the clutch brake of a 1916 D-45 Buick be remedied?
2—Is there any way in which a 1916 model 25 Maxwell may be wired to start on the storage

battery? If so, kindly publish a diagram showing this arrangement.—A. E. Phillips.

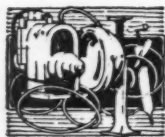
1.—Put a little neatsfoot oil or some 600-W on it. When the car is new this little brake sometimes squeaks until the leather gets a glaze, when it should operate satisfactorily.

2.—The Maxwell 25 does start on the storage battery. There is no other way it can start so long as you use the electric starting system.

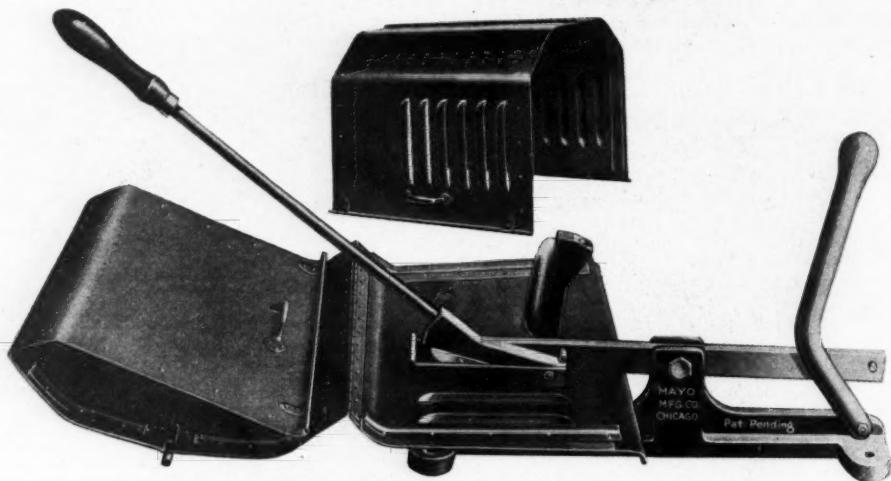
NOVEL BERTHS FOR TOURING CARS Arrangement Permits of Upper and Lower Compartments for Sleeping

Denver, Colo.—Editor Motor Age—Fig. 4 shows lower and upper berths for touring cars, developed at Denver. It will be seen in bottom view that the lower berth is formed by cutting the lack of the front seat near each side and hinging the back of the front seat so it will open backwards in a way that it will line up with the seat cushions, and there are extra filler cushions to place between the front seat cushions and the dash.

The top illustration shows the upper berth, a stretcher $4\frac{1}{2}$ by 6 feet with 10-inch side walls. It is supported by the bow brackets at the rear and has front foot that rests on the front doors, and a tightening device attached to the front of the chassis, a means by which it may be adjusted to any desired tension, thereby forming a very practical and comfortable bed. It rolls up into a small space and has a neat dustproof cover, which rests on the top of the tonneau when not in use, and does not interfere with the passengers or the raising or lowering of the top, and is out of sight when the top is down owing to the fact that the dust hood for the top comes over the berth.—F. C. P.



The Accessory Corner



THE MAYO CUTTING MACHINE

This device makes possible the ventilating of any hood and is said not to crack enamel

Mayo Cutting Machine

A DEVICE that is designed especially for the enterprising dealer, or the repair man, has been brought out by the Mayo Mfg. Co., Chicago. This machine, which is known as the Mayo louvre cutting machine for ventilating motor car hoods, permits of putting in ventilations in 15 minutes on all makes of cars. It makes a clean cut and presses an ornamental louvre at one operation and is guaranteed not to crack or mar the finish of any hood.

It is strongly constructed with hardened tool steel cutters for left and right side of hoods and the cutters may be removed and sharpened.

Morgan Specialties

The Morgan Mfg. Co., Newport, R. I., among its specialties this season, has included a ball joint for making connections between the steering wheel and throttle, timer or magneto levers and also an exhaust and inlet valve for Ford cars. The latter have gray iron heads and a carbon steel stem, the head being affixed to the stem by a new process which the maker claims prevents it from working loose or becoming detached in any way. The valve seat is turned up true with the stem and the latter has a hole drilled through the end for the key or pin.

The ball joints come in thirteen sizes, ranging from $\frac{3}{2}$ to 10/32 in size and in price from 12 to 15 cents each. Special combinations of sizes are made to order. The exhaust and inlet valves sell for 30 cents.

Ona-Moto-Lite

A rear light signal under the name of Ona-Moto-Lite has been brought out by Ona-Moto-Lite Co., Cleveland, O. This device consists of a small box electrically lighted, the top or cover of which has an arrow and the word "Stop." When a left

turn is about to be made, the arrow shows red and the word, "stop," white, while a right turn or a stop is indicated by the reverse—a white arrow and the word "Stop" in red. A pilot light mounted on the switch indicates to the driver that the signal is operating properly.

The device is nicely finished in a glossy black hard enamel, and includes electric pilot switch, wire, etc., ready for installation, at a price of \$5, or will be finished in any color to match a car for 50 cents additional.

Duplex-Victor Tire Carriers

The International Stamping Co., Leavitt and Kinzie streets, Chicago, is offering two tire carriers for Ford cars under the name of Victor and Duplex, as shown herewith. The Victor is made of sheet steel in three sections, which completely inclose and protect the two tires, as shown, while the Duplex is an abbreviated portion of the lower half section of the Victor with bars across the top. One other brand, known as the Simplex, is a duplicate of the Duplex except that it is for one tire only. All are finished in black enamel.

The Victor sells at \$10 for 30 by $3\frac{1}{2}$ size, which is not designed for demountable rims. Another size of the Victor, 31 by $3\frac{1}{2}$, which will accommodate demountable rims, sells for \$12. Prices of the Duplex vary according to the size of the tires one wishes to use, the 31 or 32 by $3\frac{1}{2}$ being \$4.50, and the 36, 37, 38 or 40 by $5\frac{1}{2}$, \$7. Prices for the Simplex,

over the same range in sizes as for the Duplex, run from \$3 for the smallest size to \$5 for the largest.

Zeglen Puncture Proof Tires

The famous Zeglen fabric, which has been the coat of kings and monarchs of Europe, being the invention of Casmir Zeglen, is being marketed by the inventor of the fabric at South Bend, Ind. As nearly every one knows, the Zeglen fabric is supposed to be impervious to everything from bullets down, and monarchs of foreign countries have found in this fabric a certain protection from cranks and assassins, especially so far as their bodies were concerned.

The Zeglen patents cover an improvement in the method of weaving, whereby it is practical to weave a fabric of any reasonable thickness from 1 to 3 inches, consequently the inventor is turning his mind toward the manufacture of tires in the belief that casings made of this material will prove to be the only pneumatic tire of ordinary construction that will be puncture-proof in all the name implies.

Motor-Aid

An accessory for use on motor trucks that is said to save 25 per cent or more in gasoline cost is being marketed by the Motor-Aid Co., 105 West Monroe street, Chicago. The illustration herewith gives an idea of the outer construction. The inner construction consists of a fan wheel with a heavy rim, the wheel working on ball bearings. The exhaust from the engine starts the wheel in motion and the action of the wheel creates a suction which draws the gases out. The device is installed by cutting the exhaust pipe and the right end, as shown in the illustration, is attached to that part of the exhaust pipe nearest the motor. As will be seen by the illustration, this connection consists of a split sleeve to insure air-tight installation, and the device also is furnished with a similar connection on the other end, if desired.

Among the claims of the manufacturer



PRODUCTS OF TWO CONCERNS

The upper view is of the Form-A-Truck and the lower a ball joint and inlet valve

for Motor-Aid is a lower fuel consumption, an elimination of back pressure, an improvement in motor operation, clearer cylinders, valves and exhaust channel, a closer seating of exhaust valves and for the promotion of prompt firing, quick starting and cool and quiet running. The device sells for \$30.

Form-A-Truck

G. E. Holmes & Co., Milwaukee, Wis., is offering for sale a device known as the Form-A-Truck, which is the invention of A. D. Smith, Seattle, Wash. It consists of an extension with two truck wheels that may be attached to almost any make of car. Its greatest use, however, is said to be in converting the lighter cars, like the Ford, into 1-ton delivery trucks. Attached to the Ford chassis, it permits a wagon body space of 8 feet back of the seat. The rear wheels of the Ford car are not used, the Form-A-Truck has its own solid axle and roller bearings, together with heavy truck wheels having solid rubber tires. Heavier side springs give approximately the same strength and rigidity possessed by the regular 1-ton truck. The attachment sells for \$350.

Reinforced Magnalite Pistons

The Walker M. Levett Co., New York, maker of Magnalite pistons, has perfected a system of reinforcing ribs for pistons, which is shown in an illustration elsewhere in this department. Apparently the company successfully has distributed the carrying strength of the piston by this reinforcement so that all possible stress under extremely high speed is provided for. At the same time a light-weight construction is permitted, which is said to insure a minimum weight for the pistons, with a consequent lessening of weight at the vital point of reciprocating parts. The construction and material entering into the manufacture of Magnalite pistons is the same as described in a recent issue of Motor Age.

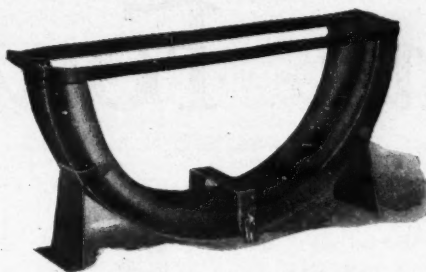
No-Glare Headlight

The Vosburgh Miniature Lamp Co., West Orange, N. J., has brought out a lamp

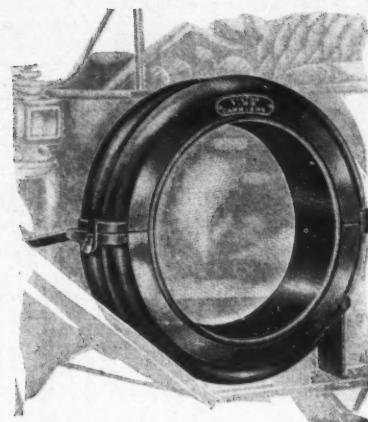


REINFORCED MAGNALITE PISTON

Note the ribs which are designed to give greater strength



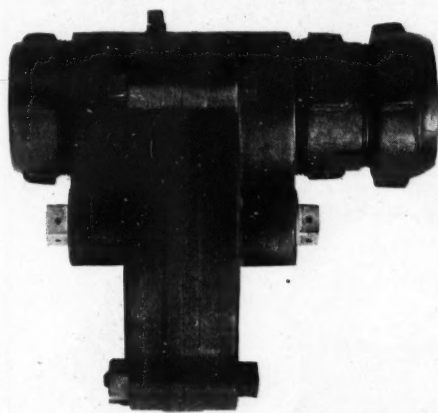
TWO TYPES OF TIRE CARRIERS
Above is shown the Duplex and at the right the Victor



under the name No-Glare, that is designed to comply with the laws prohibiting glaring headlights. These lamps are made in a variety of voltages—7, 9, 14 and 21—and give 30 candlepower. They give a clear white light and are said to eliminate all glare.

Guarded Robe Lock

For locking the robes on a car which is abandoned by the driver temporarily, a combination device has been brought out by the Mechanical Products Co., Cleveland, O., whereby these can be clamped to the robe rail without danger of removal except by tools. It is intended to prevent



THE MOTOR-AID
Mechanical device which is designed to pull exhaust gases for cylinders

the theft of robes, raincoats, grips, gloves, dusters, packages and other articles from the car and also eliminates the necessity of dragging the robes into the restaurant or home when the car is stopped.

The Guardian lock operates by combination, thus obviating the necessity for a key which can be lost. There is no ratchet on the lock and it can be closed in any position. The device is $\frac{3}{4}$ inch high by $2\frac{1}{4}$ inches wide when closed. The jaws which clamp over the robe are $1\frac{1}{4}$ inches wide. The lock is made of heavy sheet steel nickel plated. The price of the device is \$1.

Spitler Puncture Plug

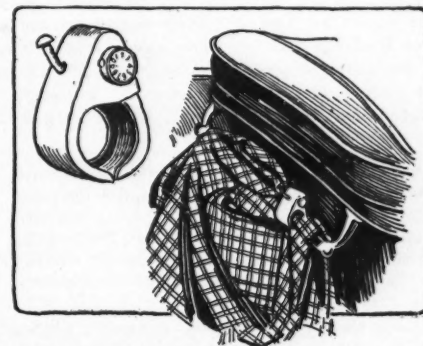
A device, designed to effect a permanent repair of punctures and small blow-outs without the use of cement or patches and without vulcanizing or soiling the hands, is being marketed by the Spitler Puncture Plug Co., Inc., New York. These plugs consist of a disk with a threaded projection which is slipped into the puncture

or blowout on its edge and which covers the under side of the tube or shoe where the puncture or blowout occurs; then, a cap is placed over the threaded projection of the disk so that it covers the outside of the tube or shoe; a lock cap then screws onto the threaded projection, holding the cap in place and being tightened by a key so that it is impossible for the tube to leak.

The manufacturer claims that there is no friction between the plugs and the shoe and that they cannot injure the fabric of the shoe nor the inner tube on this account. There is no pressure on the edges of the plug, they claim, so the latter cannot cut the inner tube. The plugs are made of brass and sell for \$1 per set of four.

Stryker Headlight Deflector

For deflecting the rays of headlights, so as to permit the rays to be thrown on the ground, but not to bother pedestrians or approaching cars, the Stryker headlight deflector makes use of a bulb in which the rays of light are brought under control. The bulb, which is made by C. L. Stryker, Buffalo, N. Y., is darkened so that the reflector cannot throw the light to a height above the ground sufficient to reach the eyes of the pedestrian. The deflector can be placed on any globe and if one is broken or burned out it can be moved to another, since it is indestructible. The deflector does not dim the rays, it simply deflects them to the roadway where they are most needed for ease in driving. The price is \$1 a pair.



GUARDIAN ROBE RAIL LOCK
Combination device as a prevention against theft of apparel, etc.

From the Four Winds



When you're through I'll show you a quarter

WANTS GOOD CAR BAD—Someone in Columbus, O., wants to buy a secondhand Ford car very, very bad. Not willing to chance the iron hand of the law in satisfying his desire by getting one other than in the honest way, he resorted to a unique method of advertising his wants by having placed neatly-printed cards in nearly all the Fords that happened in the business district. The exact text of the card found by the driver said, "I want to buy a Ford—if your car or your neighbor's car is for sale, address Lock Box 726, Columbus, O. Of course, it must be a bargain. Sincerely.—One Who Wants One Bad." The cards were placed on the driver's seat, where they would attract the most attention.

KENTUCKY Cars Number 19,124—According to Hugh Ramsey, deputy commissioner of motor vehicles, the total registration in Kentucky up to October 15 was 19,124 cars. There are about 3,800 motor vehicles in Jefferson county, of which Louisville is the county seat.

Uses New Traffic Signal—Sergeant Ambos, of the Columbus, Ohio police department, has designed an electric signal lamp to be used in directing traffic during the day and night. By the use of the signal lamp the

traffic officer directs the vehicular and street car flow from the curb by a system of electric buttons or switches. The red and green lenses used in the lamp are sufficiently powerful to be seen during the day.

Turns from Horses to Motors—Hart Bros., Dallas, Tex., the largest horse and mule handlers in the world, who recently sold the French government in a few weeks 38,000 head, are turning to the motor car business with the prospect of handling it on as large a scale as they have handled horses. The buyers will not be so likely to hold off to

company will occupy one of the finest three-story buildings in Dallas and will establish there a complete garage and service department, with complete facilities. It will handle Maxwells exclusively.

Every Twenty-ninth Ohioan Owns Cars—According to the latest figures one person in every twenty-nine owns a motor car in Ohio. This is accounted for from the fact that on October 30 there were 180,000 cars in the state. Their total valuation is approaching the \$100,000,000 mark.

Elect Club President—Oscar Stegeman, president of the Stegeman Motor Car Co., Milwaukee, Wis., truck builder, was elected president of the Milwaukee Automobile Club at the annual meeting of the board of directors October 22. Mr. Stegeman served as first vice-president two terms.

St. Louis Registration for Month—Statistics from the office of Missouri's secretary of state indicate that 324 motor cars, including 46 different makes, were licensed to operate in St. Louis during September. Fords led with 164, Overland was second with 20, Dodge 17, Buick 16, Chalmers and Columbia Taxi 11, Cadillac 10.

Motor Headlights Light Dance Hall—Headlights were put to a novel use at a homecoming celebration at Sparta, Mich., recently. One of the features of the homecoming celebration was a bowery dance each evening. The first evening, however, for some reason no arrangement was made to light the dancing floor, which was out of doors. A garage proprietor came to the rescue by driving a number of machines to the spot and focusing the headlights on the floor. The light was satisfactory.

Islands of Safety for Boston—It is understood that the Boston, Mass., street commissioners have abandoned the plan to make every motor car stop whenever a street car stopped anywhere in the city, against which the motorists protested at a hearing 2 weeks ago. Instead the commissioners now are trying to work out what will be termed islands of safety at certain streets where lines will be painted on the street surfaces and motorists or drivers of other vehicles will not be allowed to cross the spaces while people are there.

Reo Basket Ball Team—Following the close of the baseball season at the Reo Motor Car Co.'s plant at Lansing, Mich., active steps have been taken by the athletic and social division of the company's welfare department looking toward the establishment of a basket ball league among the company's employees. The league will consist of five teams, and it is expected a cup will be donated for the winning team. Because some of the men are forced to work overtime the games will be played Wednesday and Saturday evenings, when all the men are at liberty, and the contests will be played at the Reo club rooms.

Colorado's License Ruling—Colorado motor car dealers and prospective buyers are elated over a ruling just made by Secretary of State John E. Ramer that all new cars registered for the remainder of 1915 will be granted an owner's or dealer's license for \$1 each, regardless of horsepower. The regular fees are a \$5 flat rate for dealer's license and \$2.50, \$5 and \$10 for owner's license, with horsepower divisions at 20 and 40. Officers of the Automobile Trades Association believe that this concession will help early sales considerably, inasmuch as prospective buyers will not be so likely to hold off to

save the extra expense of a license for only 2 months.

Association Will Recover Cars—The Anti-Horse Thief Association, composed of Illinois farmers, who organized years ago to catch thieves with a propensity for the annexing of horse flesh, is about to change its name. Horses have become so scarce that the association finds its occupation gone. As nearly all farmers now own motor cars, they discover that the gentry which could not resist the opportunity to make away with a horse now are after motor cars and that as many are being stolen now as there were horses 20 to 30 years ago. The crooks have revised their occupations to suit the times.

Good Roads Activities

Michigan Plans Highway Building—Nineteen sixteen is expected to be the banner year for good roads in Michigan. Plans now under way will give the Wolverine state, when they materialize next year, many miles of good highways that will offer good traveling facilities for the motoring fraternity.

New Mexico May Get Concrete Road—The Commercial Club, Albuquerque, N. M., representing the property owners of Albuquerque and Bernalillo county, has recommended to the state highway commission that a thorough test of concrete as a road surfacing material for New Mexico state highways be made on the Albuquerque-Estancia valley highway.

Missouri Road Under Construction—The first lap of the proposed highway between St. Louis and Springfield, Mo.—a 68-mile stretch from St. Louis to Sullivan—has just been completed. The work now is being carried westward to Springfield and according to John T. Woodruff, chairman of the greater Springfield committee, which is promoting the work on the road, the new highway will be completed early next fall.

Elect Highway Officials—At a recent meeting of the chief promoters of the movement to construct a first class highway between San Antonio and Houston, Tex., held at Luling, the Central Highway Association was organized with Gus Russeck, mayor of Schulenburg, president, and J. P. Bridges, of Luling, secretary and treasurer. Directors from the various towns on the route of the proposed highway were elected.

Road to Boone's Home—A project is on foot to route the Boone Way southeast from Cumberland Gap to Mocksville, N. C., the old home of Daniel Boone, according to James Maret, president of the Boone Way Association, who recently addressed the Southern Appalachian Good Roads Association at Bluefield, W. Va., on road development in Kentucky. Mr. Maret stated that this would double the length of the road, Mocksville being 500 miles from Louisville and Cumberland Gap being exactly half way to Mocksville. This project may be carried out during 1916, he said.

New Mexico Plans Campaign—At a meeting of the State Highways Officials' Association held in Santa Fe, N. M., resolutions were adopted indorsing the State highway commission and the county road board system. It was recommended that where necessary for the sake of harmony a member of the board of county commissioners be appointed on the road board. The United States department of agriculture was requested to make provisions for an advance of \$2,000,000 annually for building roads in the national forests of New Mexico. Congress was urged to pass joint memorial No. 2 asking for 2,000,000 acres of public lands in New Mexico for highway purposes. A resolution on broad tire vehicles was referred to the legislative committee. State Engineer James A. French in an address

before the association stated that there would be \$1,250,000 available for good roads in New Mexico during the coming year. He said that he plans to have 1,000 men at work by January 1 with teams, scrapers, rollers and crushers to make every road in the state passable.

Red River to Gulf Highway—The Red River-to-the-Gulf Highway Association met at Palestine, Tex., recently and a permanent organization was effected by the election of H. A. Fisher, Crockett, chairman; E. P. Chandler, Houston, vice-chairman; Tom L. Beauchamp, Paris, secretary-treasurer.

Hawaiian Road Completed—A magnificent scenic road of 240 miles around the entire island of Hawaii has been completed. The entire circuit can be made in two days, and it is becoming increasingly popular with tourists. It also is greatly increasing the demand for motor cars in that part of the country. There are two active as well as two extinct volcanoes in this circuit.

Washington Road Men Meet—The sixteenth annual convention of the Washington State Good Roads Association was held at Ellensburg, Wash., Oct. 26 and 27, at which over 200 delegates from all parts of the state met to discuss good roads measures and select a meeting place for 1916. The sentiment of the delegates was unanimously in favor of continuing the present permanent and public highway tax levies and vigorously to push to completion the

highway projects already begun, particularly the Sunset highway from Snoqualmie pass to Spokane, and the Pacific highway, which reaches across the state from Blaine to Vancouver, Wash.

Roads to Yellowstone Exonerated—When it is considered that a general impression prevailed that the roads to and from the Yellowstone were not particularly good for motor touring, one has only to study the figures for the volume of motor traffic entering the park between August 1 and September 15. In all 3,513 persons, in 958 cars, toured the park between those dates, which was one in motor cars to seven entering in all other ways for the entire 3 months that the park was open.

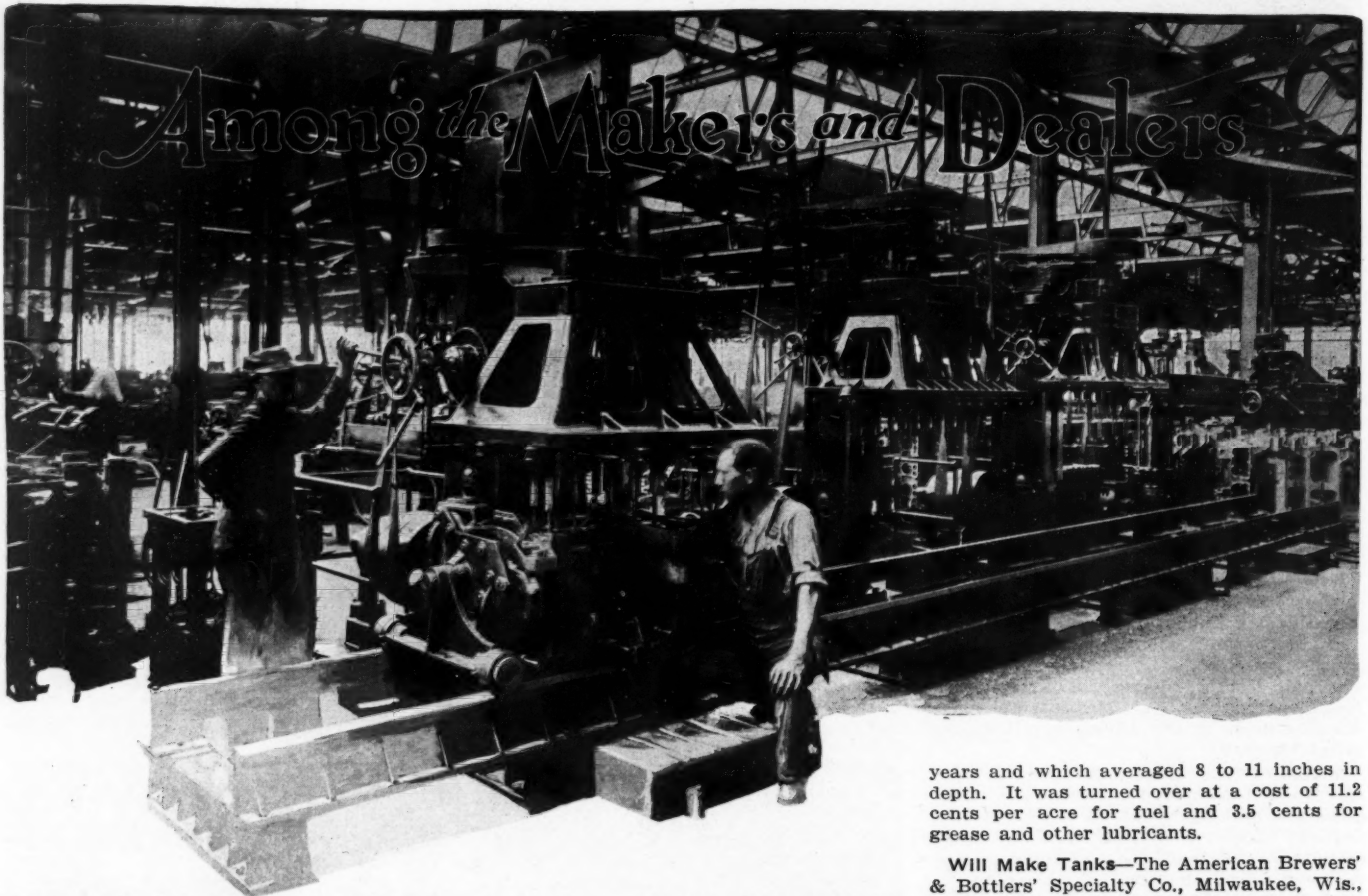
With the Motor Clubs

Motor Club Is Organized—Frank B. Buckwalter was made president of the Sioux City Motor Club, Sioux City, Ia., which was permanently organized at a meeting of auto and good roads enthusiasts last week. Dr. F. A. Seeman was selected vice-president; Guy Taylor, secretary, and E. T. Kearney, treasurer.

Club Marks Roads—Attractive and durable road signs have been installed on the Oregon roads by the McMinnville Automobile Club, and along the West Side highway. The signs are 15 inches square and are red with white lettering. Another road covered was the highway from Portland to Eugene.



TOWNSHIP OSSIFER'S SPEED TRAP; STOP WATCH AND CORNSTALKS—In Western avenue, just outside of Harvey, Ill., is a beautiful curve. Its approaches are smooth paved and it is the delight of the motor enthusiast. At the exact curve the township officer is in the habit of placing himself. Is there a rope across the road? There is not. Instead, clutched tightly in one hand of the vigilant officer is a stop watch, and his eyes, to use the best fictional terms, are glued on the road a hundred yards or so beyond the turn. There are to be found several cornstalks, stretched across the highway. Directly in front of the constable at the exact point of the turn is a similar row of stalks. Along comes a motorist. Flip—and up goes a cornstalk down the road. Snap—goes the stop watch. Flip—goes another cornstalk up at the turn. Snap—goes the stop watch, twenty-five miles an hour. Then the arrest and a fine by the justice follows.



DOES 3 DAYS' WORK IN 3 MINUTES—Among the many special machines in use at the Detroit plant of the Continental Motor Mfg. Co., the railroad gang drill, shown in the accompanying illustration, is one of the most interesting to Continental visitors who, for the first time, come into actual contact with real large-scale production. To see this mammoth drill in operation on its own special railway track indeed is a revelation to the uninitiated. Two men operating this device can drill accurately 123 holes in a crankcase in 3 minutes' time. The same two men drilling the same holes by the old hand method would utilize 3 whole days at the task and the chances are that their work would lack the absolute accuracy of the machine drilling.

WILL Make Motor Trailers—The Lowell Cutter Co., Lowell, Mich., in business since 1885 as a manufacturer of cutter bodies, has decided to bring out motor trailers.

Cozzens Goes to London—Fred H. Cozzens, export manager of the Four Wheel Drive Co., Clintonville, Wis., who has been in Petrograd, Russia for the last few months, has finished his work there and is now on his way to London, Eng.

Jossman Manages Columbia Sales—Henry Jossman has been appointed sales manager of the Columbia Truck & Trailer Co., Pontiac, Mich., which recently moved to that city from Kalamazoo. Mr. Jossman was formerly connected with the Oakland Motor Car Co.

Cotton 4-Wheel Advertising Manager—J. D. Cotton has been appointed advertising manager of the Four Wheel Drive Co., Clintonville, Wis., and already has taken up the duties of the advertising and promotion department. Mr. Cotton for many years was connected with a Clintonville newspaper.

Bringing Out New Tractor—The Townsend Mfg. Co., Beloit, Wis., is bringing out a new gasoline tractor for general purposes in the city and on the farm. It is propelled by a gasoline engine rated at 10 to 20 horsepower and is built in several types. The tractor may be used for plowing, seeding, cultivating and similar work as well as for filling silos, hauling farm loads, etc. The tractor in a recent test handled three 14-inch plows in sod which had not been plowed for 40

years and which averaged 8 to 11 inches in depth. It was turned over at a cost of 11.2 cents per acre for fuel and 3.5 cents for grease and other lubricants.

Will Make Tanks—The American Brewers' & Bottlers' Specialty Co., Milwaukee, Wis., has entered the motor car field and is specializing on gasoline tanks, its equipment being especially adapted to handle this class of work.

Milwaukee Engine Adds—The Milwaukee Auto Engine & Supply Co., Milwaukee, Wis., has broken ground for its new factory and machine shop. Work will be rushed so that occupancy may be taken early in December. The shop will cost about \$15,000.

Schwab and Beckler Leave Gemco—W. H. Schwab, formerly sales manager of the Gemco Mfg. Co., Milwaukee, Wis., and C. W. Beckler, formerly advertising manager of the same concern, have severed their connection with the Gemco company and become interested in the Auto Parts Mfg. Co., Milwaukee.

Splitdorf Company Plans Addition—The Splitdorf Electrical Co., Newark, N. J., maker of Dixie magnetos, Splitdorf spark plugs and mag-dynamos, has adopted plans for additional factory facilities in the shape of a new building 300 feet long by 50 wide and six stories high, to be erected adjoining the present main factory. It will be built of brick, and will equal 75 percent of the present plant space. The additional floor space will be about 100,000 feet. The new factory is expected to be finished within 6 months, and will contain much additional equipment. At the present time, the output of magnetos is 1,500 a day, but production plans contemplate an output of 2,000 a day by next spring when the new building is completed.

Changes in Case Personnel—Richard T. Robinson, for many years secretary of the J. I. Case T. M. Co., Racine, Wis., has resigned and will move to California. He is succeeded by W. F. Sawyer, who has been associated with the Case company for 14 years and until now was manager of the sales department. Elias J. Gittings succeeds Mr. Sawyer and R. B. Coleman is promoted to manager of the collection department. Mr. Robinson is one of the founders of the

The Show Circuit

Los Angeles Truck Show—Los Angeles' third annual motor truck show has been scheduled for the Broadway rink. The show will open November 17 and will continue four days.

Grand Rapids, Mich., Show—The seventh annual Grand Rapids show will be held during the week of February 20 in the Klingman Furniture Exhibition building and will be in direct charge of the Automobile Business Association, comprising local dealers and accessory men. Decorative plans of a special nature are being worked out.

Providence, R. I., Show—The Rhode Island Automobile Dealers' Association now has enough applications to insure the exhibition space being fully taken when the Providence show comes, November 12 to 20. A number of dealers outside the city have applied for space and there are many accessory concerns ready to take whatever they can get. As there will be a number of big guns in the armory this year the arrangement for space necessitated some changes from a year ago, but it was worked out satisfactorily, and the guns will be an added attraction instead of a detriment, it is believed.

Case company. Thus far, the company has made no announcement of an election of a general manager to succeed F. Lee Norton, who retired a short time ago.

4-Wheel Drive Adds—The Four Wheel Drive Co., Clintonville, Wis., has made large additions to its plant and now is erecting a commodious office building, immediately adjacent to the factory building proper.

Twenty-five Dorts Daily—At the Dort Motor Car Co.'s plant, Flint, Mich., an average of twenty-five Dort cars a day are now being made. This production is to be increased to forty a day beginning December 1 and to fifty a day beginning January 1. Since the first Dort car was shipped May 1 a few more than 1,800 have been delivered.

Seek Uniform Announcement Time—The Tri-City Trade Association, Rock Island, Ill., composed of dealers of Rock Island, Moline and Davenport, adopted resolutions this week which favored the introduction of new models between December 1 and February 1. A copy of the resolutions was sent to the National Automobile Chamber of Commerce, the national organization of automobile manufacturers.

Dort Buys Property—Land valued at \$40,000 located west of the Dort Motor Car Co., Flint, Mich., has been acquired by J. Dallas Dort, president of the company, to provide for future expansion. The property comprises about 75,000 square feet of ground. No buildings will be erected for the present time on the land, but it is expected that with the growing business the Dort company will start some building work early next year.

Paige Sales Advance—During the first fifteen days of October, or thirteen actual working days, more Paige cars were shipped out of the factory than in any other equal period in the history of the Paige-Detroit Motor Car Co. As a matter of fact sales for that period show an increase of 600 percent over October of last year; that is, providing the shipments and sales for the remainder of the month show proportionate volume and activity.

Reo Trucks in Tabernacle—The Reo Motor Truck Co., Lansing, Mich., has purchased the large structure, known as the Lyon Tabernacle, which has been used by Dr. Lyon. The truck business has been so exceptionally large that additional room had to be provided at once, although additions to the truck plant are under way. However, conditions have been such that much work has been going on on the grounds outside the plant and where nei-

ther the workmen nor the material and trucks were under shelter. It was principally to overcome this that the tabernacle building has been purchased.

Eckhart New Auburn President—The Auburn Automobile Co., Auburn, Ind., has elected Morris Eckhart president, succeeding his father, the late Charles Eckhart, who died a few weeks ago.

Kellar Tool Works Nights—The Kellar Pneumatic Tool Co., Fond du Lac, Wis., specializing in the manufacture of special tools, dies, punches and similar tools for manufacturers of motors and motor vehicles, has been obliged to put on a night shift to accommodate the extraordinary demand. According to Julius Kellar, Jr., general manager, the company has enough orders from one motor car manufacturer alone to keep the plant taxed to capacity night and

day until the end of the year, and hardly a day passes that the company does not receive orders for special tools from one or two large builders.

Will Handle M. & S. Differential—The Canadian Fairbanks-Morse Co. with branch houses in all of the important cities throughout the Dominion, has closed a contract with the M. & S. Gear Co., Detroit, Mich., to act as the Canadian distributor for the M. & S. differential.

True to Gemco—J. B. True, Jr., has been appointed director of sales of the Gemco Mfg. Co., Milwaukee, Wis. Mr. True has had wide experience in merchandising and advertising, and will handle the advertising as well as the sales department of the Gemco company.

Davis Occupies New Plant—The Davis Mfg. Co., Milwaukee, Wis., has abandoned its old plant and removed the entire equipment to its new plant. The Davis company specializes on large motors for tractor purposes, although building, to some extent, motors for several motor car manufacturing plants.

Lavigne Gear Reorganized—The Lavigne Gear Co., Racine, Wis., one of the most extensive manufacturers of steering gears for passenger and commercial vehicles in the United States, has been reorganized and has put into effect an extension program which will practically double its capacity. The name of the corporation has been changed to Lavigne Gear Co., to simplify pronunciation. Officers are: President and treasurer, Herman A. Uihlein, Milwaukee; vice-president, P. B. Wohlrab; secretary, D. L. Robertson; sales and advertising manager, E. M. Caskey.

Changes Name and Location—The Western Tire & Rubber Co. is building a three-story factory at Akron, O., where it will move its plant December 1. The company has been reincorporated under Ohio laws, under the name of the General Rubber Mfg. Co., and the capital stock increased to \$200,000. It will continue to manufacture the K. C. line of tire accessories. In addition to this, it is adding equipment to manufacture 400 tires a day. The new factory will be in full operation January 1. The personnel of the company will remain unchanged.

Coming Motor Events

SHOWS

October 25 - November 13—Portland, Ore., show.
November 12-20—Providence, R. I., show.
November 22-27—Binghamton, N. Y., show.
November 29-Dec. 4—Kansas City, Mo., electrical show.
January 1-8—New York show.
January 8-15—Cleveland show.
January 22-29—Chicago show.
January 29-February 5—Minneapolis show.
February 7-12—Kansas City, Mo., show.
February 14-19—Des Moines, Ia., show.
February 20-25—Grand Rapids, Mich., show.
February 21-27—Omaha, Neb., show.
February 21-26—Omaha, Neb., show.
February 29-March 4—Fort Dodge, Ia., show.
March 4-11—Boston show.



Gram-Bernstein 5-ton truck, with 20 by 7-foot body, that hauls a carload of cotton each trip, at Charleston, S. C.



Champion

"TOLEDO MADE FOR THE WHOLE WORLD'S TRADE"



Order Your Priming Plugs Early

Every motorist knows that Champion Priming Plugs furnish the one quick and always reliable method of starting in cold weather. He uses them whether his car has a self starter or not.

But remember—the biggest, fastest demand for priming plugs comes with the first cold snap. It is then that Champion dealers are flooded with requests for these plugs.

And it is then that **you** should have a good, heavy stock of Champion Priming Plugs, if you are to reap the real profits others have found in this early winter demand.

Order today from your jobber. He can give you immediate delivery of any quantity you may desire.

The Champion Priming Plug is a tried and proved Champion Spark Plug with the addition of the priming device. The driver merely has to open the needle valve far enough to allow the gas to flow easily through the opening in the shell, tighten the valve and give the motor a quarter turn in order to start easily and smoothly. The gasoline is placed right at the sparking point of the plug. A small key attached to the needle valve readily opens and closes it, avoiding all possibility of leakage.

For those who prefer the pet-cock type of priming plug we provide the "All-in-One" Champion. This plug is exceedingly simple in construction and always positive in action.

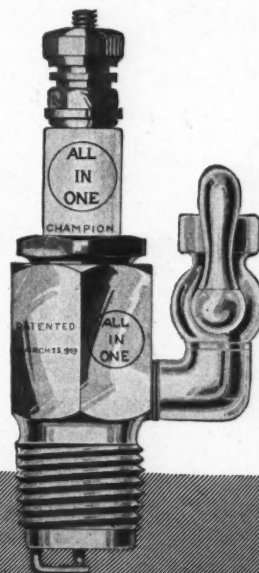
These two plugs meet every possible demand for a priming device. Both are known to practically every car owner. Do not overlook this chance. Sit down **now** and send in your order for a full supply.

These priming plugs—like all Champion Spark Plugs—are positively guaranteed to give complete satisfaction to the user or he may have free repair, replacement or his money back.

Are you familiar with the details of our Profit Sharing Plan? If not, speak to your jobber's salesman or write to us at once. It is sure to interest you.

Champion Spark Plug Company

1521 Upton Ave., Toledo, O.



Schebler

AT THE FRONT

On the firing line—

Where dependability holds in the balance the lives of thousands—

Where arrivals and departures are timed to the second—

Where success alone is tolerated—

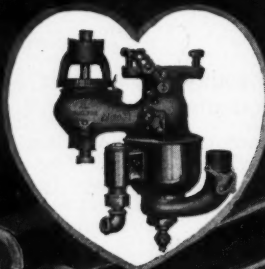
Armored cars and relief ambulances are equipped with dependable SCHEBLER—

The Universal Carburetor

SCHEBLER gives war-time service on pleasure, commercial and racing cars, at home.

To insure every-day consistent service from your own car—demand SCHEBLER.

Wheeler & Schebler
Indianapolis : Indiana



When Writing to Advertisers, Please Mention Motor Age

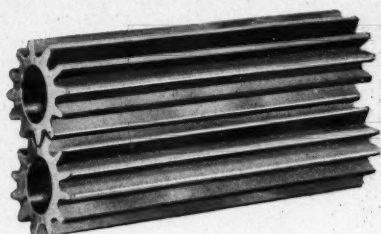


Fig. 1—Air Circulator Gears

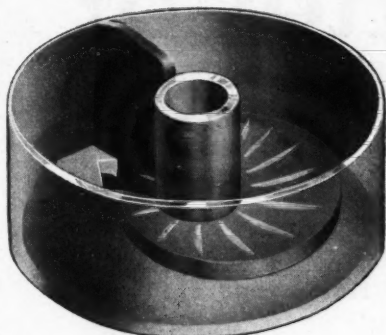


Fig. 2—Dial Chamber

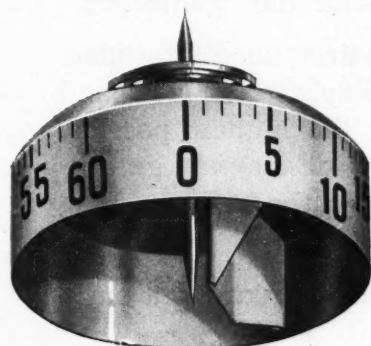


Fig. 3—Rotary Dial

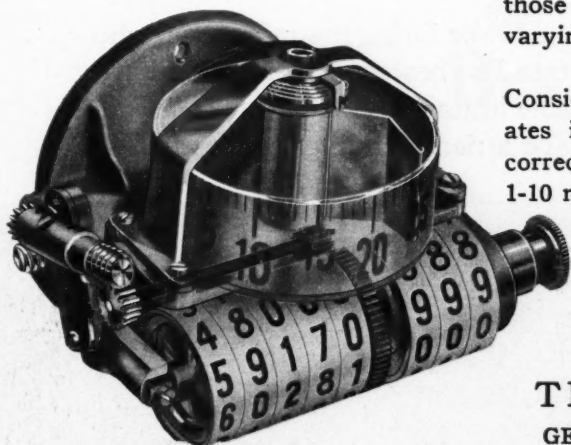


Fig. 4—Phantom View

How "Van" Works

Van's operation is based on the generation and calibration of a stream of air. Three simple elements—an air circulator (Fig. 1), a calibrated dial chamber (Fig. 2), and a rotary speed disc (Fig. 3)—comprise Van's vital organs.

With the first perceptible movement of the car's wheels, Van's flexible shaft drive starts revolving the little enmeshed air circulator gears (Fig. 1) located in the head of the instrument. An air current is thus created.

This air current passes in through a small opening at the bottom of the dial chamber (Fig. 2), and strikes against a blade integral with the cup-shaped rotary speed disc (Fig. 3), which is superimposed over the dial chamber and pivoted on two jewels (Fig. 4). The air escapes through another opening in the floor of the dial chamber.

The air current striking against this blade converts the rotary speed disc into a highly sensitive vane—somewhat similar in principle to the ordinary weathervane.

Now the faster the car travels, the faster the little gears (Fig. 1) generate air, and the more air packs in back of the little blade forcing the rotary speed disc ahead at a rate proportionate to car speed.

The big, legible numerals on the outer rim of this rotary speed disc pass by a window in Van's face, thus translating the operations taking place inside the instrument into miles per hour for the information of the driver.

The basic principle of the Van Sicklen instrument lies in the calibrating disc seen resting on the bottom of the dial chamber in Fig. 2. This disc causes the air stream operating to rotate the speed disc, to vary automatically in just those proportions which make for proper registration at varying speeds.

Consider that the pneumatic principle on which Van operates is the only speedometer principle which admits of correct calibration throughout the entire speed range from 1-10 mile per hour to 60 miles per hour.

Write for booklet containing full details regarding "VAN," the Speedometer "Built Like An Elgin Watch—By Elgin Watch Makers."

THE VAN SICKLEN COMPANY

GENERAL OFFICES:
14 Chicago St., Elgin, Ill.

FACTORY:
Elgin National Watch Co.



— and never forget it

SOME dealers still consider the automobile business a "game." Keep your ear to the ground, brother.

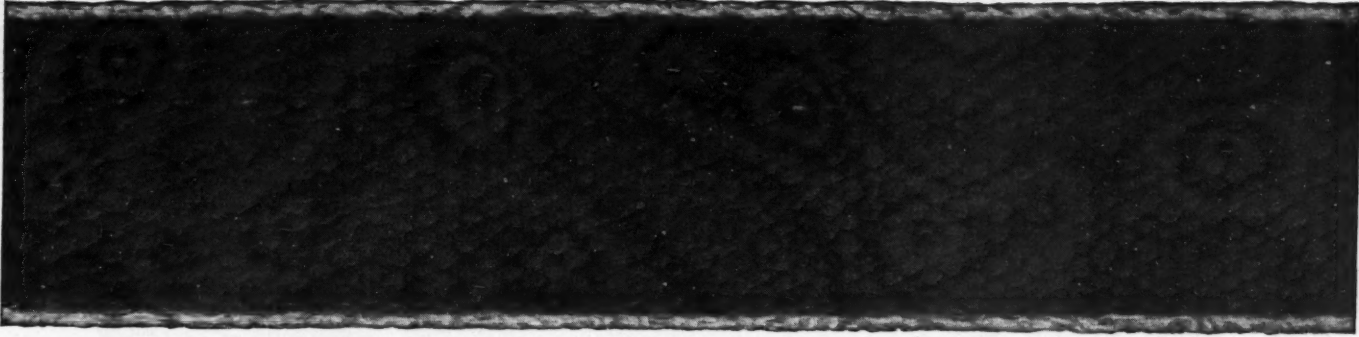
The garages and supply houses which are forging ahead these days are the *businesslike* garages and supply houses—not the "gamesters."

They are advising better tires, honest gasoline, efficient lubricants—and Raybestos. Now and then they may not make the highest possible profit per sale or per job. But they are getting the most customers. And in the long run that is what builds a business.

Are you playing a "game" or running a business?

THREE types of men have found "Raybestos" a fine name to tie up with.

One type is the brake lining manufacturer who sets out to imitate Raybestos. It is not so hard to make a passable imitation—as far as *looks* go. He can even have a name ending in "bestos."




Next comes the retailer or repair man, who, when directed to reline brakes with Raybestos, deliberately uses some inferior substitute. Sometimes he gets by with it. But his chances of substituting are growing smaller all the time.

BUT don't forget this:—The men who find the name of Raybestos the *big* source of profit are the men who *handle and recommend genuine* Raybestos. They point to the silver edging and the name Raybestos stamped on every foot of their genuine Raybestos brake lining. They are running their business for *repeat orders*.

THEY know that Raybestos is the brake lining which WEARS.

The Royal Equipment Co., Bridgeport, Conn.



Keep your eye open
for our national
advertising

TRADE MARK

Raybestos

REG. U. S. PAT. OFF.

Brake Lining

Sold by all first-class Garages and Supply Houses





"Built to Endure"

"Built to Endure"

Westcott

1916 SIXES

Everyone Who Sees the Westcott Is Amazed

Hundreds of experienced motorists have bought 1916 WESTCOTT Sixes without ever having laid eyes on the car—they bought from specifications. This gave rise to one of the most unique conditions ever recorded in the annals of the industry.

Every man who so ordered his WESTCOTT was astonished beyond words to find that the car not only measured up to specifications, but by far exceeded his most sanguine expectations in point of motor car luxury and wonderful efficiency.

It is a positive joy to the eye to see a WESTCOTT standing at the curb together with other automobiles—it is a veritable education to hear the owner enthuse about his WESTCOTT which is, beyond doubt, the finest car of the light weight tendency in the world.

If you have not seen a WESTCOTT as yet, you have missed the revelation of the 1916 season.

Catalogue mailed on request. *Immediate deliveries.*

Six-41—5 Pass. 41 H.P. Touring, \$1295	Six-41—Wheelbase 120 in.
Six-41—3 Pass. 41 H.P. Roadster, \$1295	Six-51—Wheelbase 126 in.
Six-41—3 Pass. 41 H.P. Cabriolet, \$1595	Six-41—Weight 2800 lbs.
Six-51—7 Pass. 51 H.P. Touring, \$1595	Six-51—Weight 3000 lbs.
Six-51—3 Pass. 51 H.P. Roadster, \$1595	

WESTCOTT SUPERIORITIES

More than ample leg room in driver's compartment.

Centre-aisle front seats.

Completely disappearing auxiliary seats.

Firestone Non-Skid and Kelly-Springfield Kant-Slip oversize tires on all four wheels.

Gemmer irreversible worm and sector steering gear.

Standard Delco Starting, Lighting and Ignition system.

Stewart Vacuum Gasoline system.

Timken front and rear axles.

Timken bearings in all four wheels.

Timken bearings in worm bevel differential.

Fedders genuine cellular radiator.

Dry plate multiple disc clutch.

Rayfield Carburetor bolted direct to cylinder block without manifold.

WESTCOTT Continental standard six cylinder motor.

WESTCOTT Cantilever rear springs. Chrome vanadium steel.

Firestone quick detachable, demountable rims.

No. 1 long grain, full, bright enamel leather.

Patented WESTCOTT upholstery—no buttons.

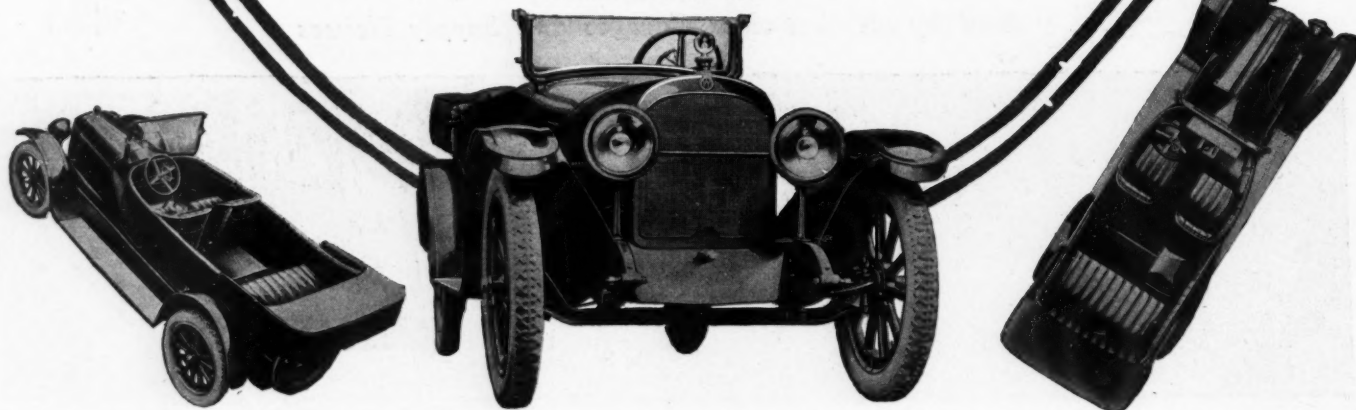
Two-bulb construction head lamps.

Finest cowl-fitting, water-tight, rain-visions and double-ventilating windshield.

Genuine Pantasote one-man top, Jiffy curtains and 20 other distinctive WESTCOTT Superiorities.

WESTCOTT MOTOR CAR COMPANY 1125 North E Street, Richmond, Ind., U. S. A.

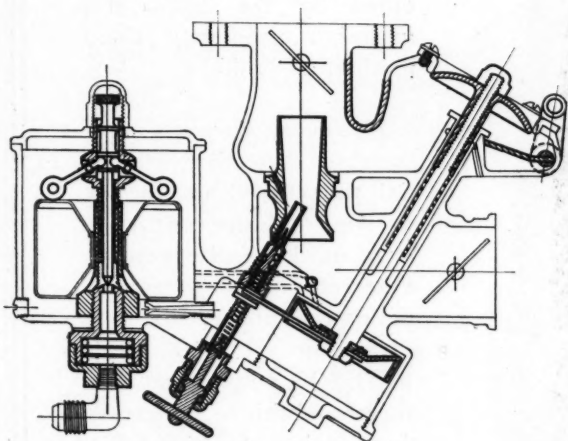
Exhibit at Panama-Pacific International Exposition, in Transportation Bldg., in charge of Messrs. Kiel & Evans, of Oakland, Cal.



When Writing to Advertisers, Please Mention Motor Age

28.9 MILES ON ONE GALLON of GASOLINE!

Edwards Carburetor Sets New Economy Record in Official A. A. A. Test



THE test, sanctioned by the A. A. A. and under the observation of F. E. Edwards, their technical representative, was made over characteristic city roads with a 1916 Model D-45 6-cylinder Buick, carrying 4 passengers and equipped with a regulation 1¼-inch EDWARDS Carburetor.

On its first appearance the EDWARDS Carburetor not only established this new economy record—28.9 miles on one gallon of gasoline—but **without change in adjustment** and on an **ordinary country road**, enabled the car to develop a speed of 58 miles per hour. Greater speed was not attempted owing to the short stretches of the roads on route covered.

On acceleration test, from a standing start the car, running through all gears, was brought up to 25 m.p.h. in 11 1/5 seconds. On high gear it accelerated from 5 to 25 m.p.h. in 11 4/5 seconds.

W. A. Edwards, the designer of the EDWARDS Carburetor, was formerly connected with the Engineering Department of two of America's leading carburetor manufacturers at the time they produced their most successful instruments. He resigned to market this instrument under his own name. **Consequently not one experimental feature enters into EDWARDS Carburetor construction.**

The EDWARDS is a carburetor of only 44 parts—fewer parts than those of any other high-class carburetor on the market.

Manufacturers—Dealers—Car Owners:

Write for detailed information.

Territory now being allotted for distributors, service stations and state agents. Write today for particulars

National Carburetor Company
154 Whiting Street, Chicago



EDWARDS-equipped Model D-45 Buick Six. Passengers: W. A. Edwards (driving), Chief Engineer National Carburetor Co.; F. E. Edwards, A. A. A. representative; W. P. Habel, Secretary National Carburetor Co.; Darwin S. Hatch, Technical Committee C. A. C.

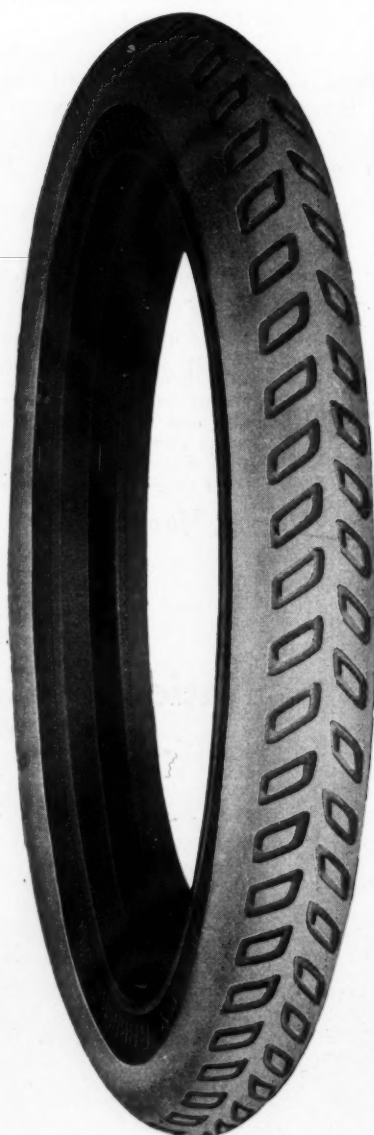


There's only one type of tire that equals the QUAKER for mileage—it's the **solid tire**—said a dealer.

That this is a statement of fact is proved by mileage records of 8,000, 10,000, 12,000, 15,000 and more miles.

But QUAKER TIRES do more than give mileage—they afford in the greatest measure the **comfort** to provide which pneumatic tires were first made, though this quality is usually overlooked in attempts of makers to increase mileage.

Another thing QUAKER TIRES do is to **save the racking strain on machines**—the secondary purpose of pneumatic tires.



The fundamentals of ease to passengers and protection of cars, the ends first sought in making QUAKERS, are secured by the kinds of materials used and the method of building.

However, we were not satisfied with the essential properties described, so we continued our efforts until we discovered a secret process of **tempering** the rubber, thereby perfecting QUAKER TIRES by adding **endurance**—and this to a degree that makes QUAKER TIRES the "MILES CHEAPER" kind.

QUAKER TIRES are now carried in stock by dealers almost everywhere, but should there be no dealer near you, write direct to Mr. Lyons at our factory.

Quaker City Rubber Co. Factory and Home Office **Philadelphia**

Drive the Year 'Round in Comfort

THE All-Year Car—a Kissel idea that has brought to motoring a heretofore unknown degree of convenience. Enjoy driving in all seasons. When the weather is fair use the touring car or roadster; then when occasion requires put on the Detachable Top—in less than half an hour's time, in your own garage—and you have a luxurious closed coach. Not **set on**—but **built in**—no indication whatsoever that it is other than a permanent, immovable part of the car. Must be seen to be appreciated.

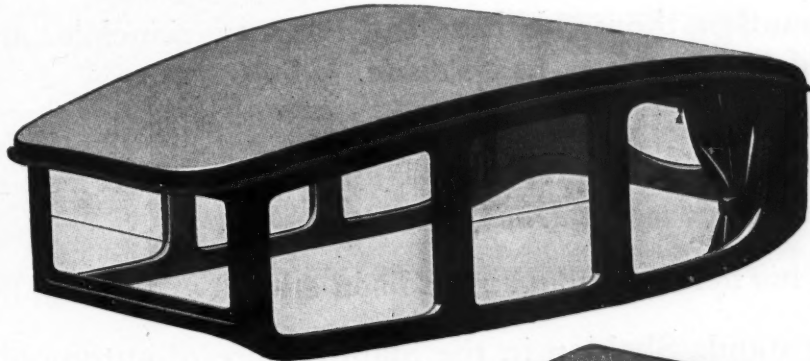
The exclusive ALL-YEAR idea is only one of many reasons for the purchase of a KisselKar. It is a **manufactured** car—every vital part built in the Kissel shops,

with the same scrupulous care, superior skill and expert supervision that have always identified the KisselKar as a **quality product**.

*Touring models \$1050, \$1250, \$1485,
\$1650, \$1750. ALL-YEAR Cars—
Coupés and Sedans—\$1450 to \$2100
Ask for particulars.*

Kissel Motor Car Company
121 Kissel Ave. Hartford, Wis.

New York, Chicago, Boston, Philadelphia,
St. Louis, Cleveland, Milwaukee, Minneapo-
lis, St. Paul, Kansas City, Buffalo, Dallas,
Pittsburgh, Cincinnati, Columbus, Toledo,
San Francisco, Los Angeles, Salt Lake City,
Omaha, Troy, Dayton, New Haven, Hart-
ford, Conn., Providence, Des Moines, Mar-
shalltown, Cedar Rapids, Montreal, Calgary,
Victoria and hundreds of other leading cities
in the United States and Canada.



The
ALL-YEAR
Car



KISSELKAR

Every Inch a Car

When Writing to Advertisers, Please Mention Motor Age

**There is
only
one
EDISON**



Countless thousands have had the same principles and the same materials with which to work as had Edison.

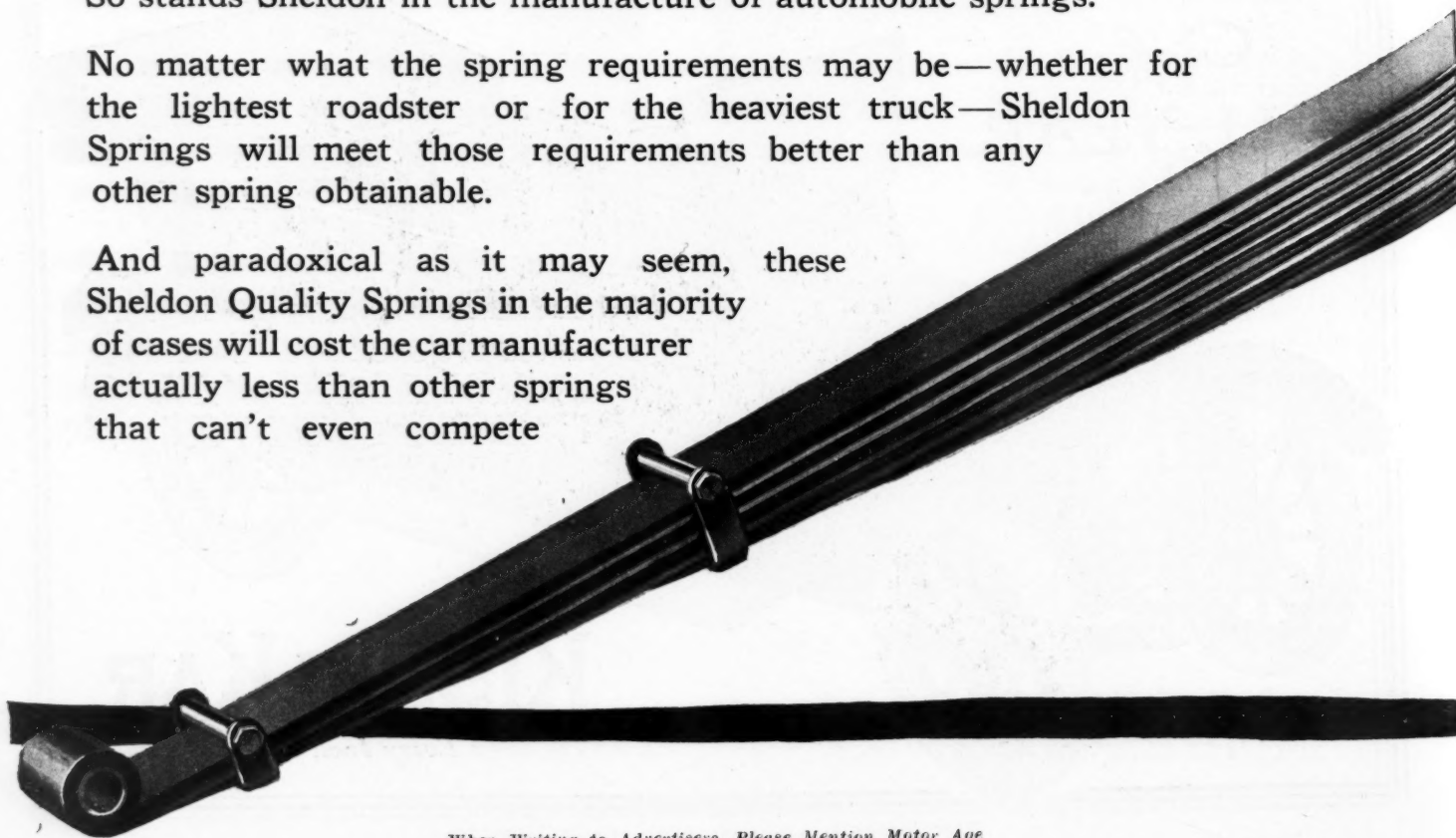
But it was Edison, alone, who was able to mould and work these raw materials in combination with Nature's laws and forces, in such manner as to insure the incandescent lamp of today.

In his field of endeavor, Edison stands at the top, beyond comparison.


So stands Sheldon in the manufacture of automobile springs.

No matter what the spring requirements may be—whether for the lightest roadster or for the heaviest truck—Sheldon Springs will meet those requirements better than any other spring obtainable.

And paradoxical as it may seem, these Sheldon Quality Springs in the majority of cases will cost the car manufacturer actually less than other springs that can't even compete



When Writing to Advertisers, Please Mention Motor Age

An illustration showing two sets of vehicle springs and axles. One set is a leaf spring assembly, and the other is a coil spring assembly. They are shown in a perspective view, with the word 'AND' centered between them.

AND

THERE IS ONLY ONE SHELDON

with Sheldon Springs from a standpoint of efficiency.

In fact, this we guarantee—No matter how low priced a car may be, Sheldon Springs are commercially practical as equipment, for while in a very few isolated cases, first cost may be a little higher, the difference is so slight as to be unworthy of consideration, while on the other hand, in the majority of cases, Sheldon Springs will show the car maker an absolute saving in cost compared with any other springs manufactured. In either case they will show a far greater length of life than any other springs that can be purchased.

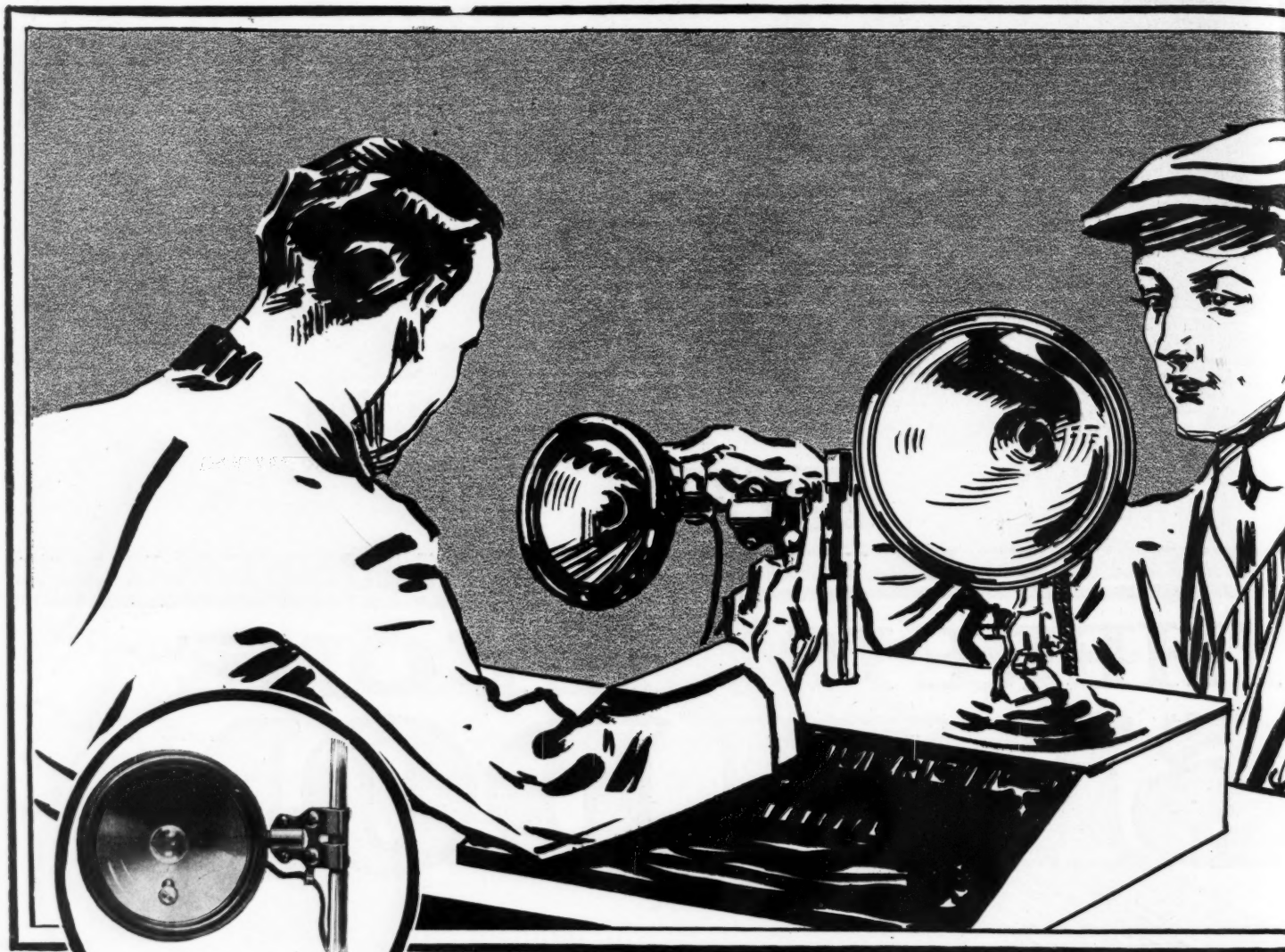
THE SHELDON AXLE AND SPRING COMPANY

Manufacturers of Springs and Axles for More Than 50 Years

WILKES-BARRE, PENNSYLVANIA

Chicago: 122 S. Michigan Blvd. San Francisco: 444 Market St. Detroit: 1215 Woodward Ave.

"Exhibiting Section 16, Transportation Building, Panama-Pacific Exposition, San Francisco"



Front View No. 79
Old Sol "De Luxe"
Spot Lamp



Rear View No. 76
Old Sol Spot Lamp



Side View No. 70
Old Sol Spot Lamp

Old Sol Spotlights for 1916

Old Sol No. 79 DeLuxe Windshield Spotlight

7 in. Door made from brass, nickel plated. Body, Bracket and Handle, black enameled. This lamp is equipped with 6 v., 21 c.p. Bulb for searchlight, and 6 v., 2 c.p. Bulb for pilot light. Both Bulbs controlled by switch at rear of handle. Focusing device located on handle just forward of control switch. This lamp is equipped with a 3 in. mirror and 4 ft. of cable.

List Price\$7.00

Old Sol No. 76 Windshield Spotlight

6 in. Door and Body. All parts black enameled. 6 v., 15 c.p. Bulb. Silver-plated Reflector. Hole with eyelet for insertion of 6 ft. cable in lamp and other end of cable provided with copper terminal. On-and-off switch at rear of handle. This lamp is equipped with a 3 in. mirror and 6 ft. of cable.

List Price, Complete.....\$4.00

Old Sol No. 70 Windshield Spotlight

7 in. Door and Body. All parts made from steel, black enameled. Bracket and Handle made from steel, black enameled. 6 v., 21 c.p. Bulb. Silver-plated Reflector. Hole with eyelet for insertion of 4 ft. cable, cable equipped with plug for cut-in on electric system for dash on automobile. Equipped with a 3 in. mirror and 4 ft. of cable. On-and-off switch at rear of handle, focusing device for concentrated or diffused light in handle just forward of control switch.

List Price\$6.00

OLD SOL

UNIVERSAL

SPOT LIGHT



**This Counter
Display Will
Start Many a Sale**

The Old Sol Silent Salesman gets to your customers in a way that is irresistible.

It puts the customer in the position of starting the sale. It plays upon his curiosity and makes him display a marked degree of interest before you bring your salesmanship to bear.

It is one of the most conspicuous counter display stands ever devised—handsome, refined and practical.

The Old Sol Silent Salesman Display Stand shows how the Old Sol Spotlight works—how it is mounted, how it is controlled and makes the customer sell himself on how much better the Old Sol Spotlight, with its ability to throw light in any direction and to any distance, is than the ordinary headlight equipment.

**Hawthorne Manufacturing Co. Bridgeport
Connecticut**

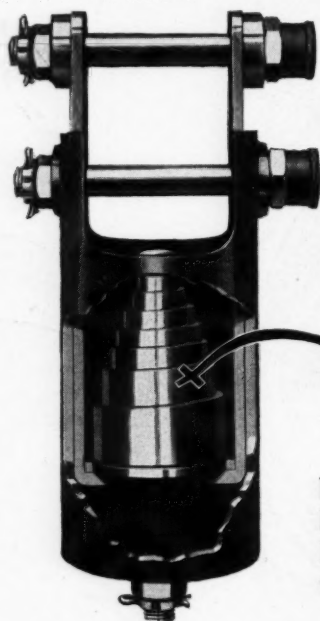


Old Sol Silent Salesman
Display Stand



One Firm One Service One Responsibility

JOHNS-MANVILLE SHOCK ABSORBER



*The
spring's
the
thing*

It takes the thump out of every road bump. It absorbs the vibration that kills both comfort and car. It makes luxuriously easy riding possible under the most unfavorable conditions.

It is the most efficient type of shock absorber spring yet devised—a combination of **resilience, compactness and strength** without equal.

The Johns-Manville Shock Absorber is made in one size only which fits rear springs up to $2\frac{1}{4}$ inches wide. It is an easy seller, easily handled and easily attached.

PRICE
PER PAIR
COMPLETE

\$15

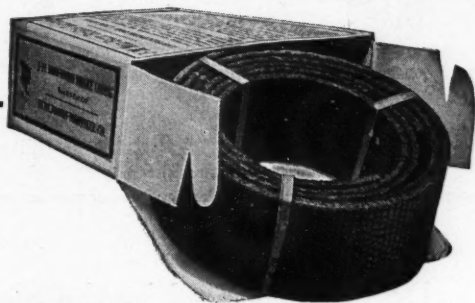


H·W·JOHNS-

Akron Atlanta Birmingham Buffalo Cincinnati Columbus Dayton Detroit Galveston Houston Kansas City
Albany Baltimore Boston Chicago Cleveland Dallas Denver Duluth Houghton Indianapolis Los Angeles
THE CANADIAN H. W. JOHNS-MANVILLE CO., Ltd., Toronto, Montreal, Winnipeg, Vancouver

When Writing to Advertisers, Please Mention Motor Age

back of every J-M Automobile Accessory



J-M Non-Burn BRAKE LINING

**Puts Your Brake Lining Business
on a Permanent Basis**

EVERY driver who has experienced the positive control—the sureness of steadily slackening motion—the consciousness of adequate braking power that J-M Non-Burn gives to his brake equipment—wants J-M Non-Burn on his brakes **always** and will seldom accept a substitute.

That is why the store that sells J-M Non-Burn enjoys a steady demand for this brand that satisfies in quality, service and price.

Dealers—Write today for our Proposition



MANVILLE CO.

Louisville Milwaukee Newark New York Philadelphia Portland St. Louis Salt Lake City Seattle Toledo Wilkes-Barre
Memphis Minneapolis New Orleans Omaha Pittsburgh Rochester St. Paul San Francisco Syracuse Washington Youngstown

When Writing to Advertisers, Please Mention Motor Age

SUCCESS COMES TO WONDER-MIST

Since this announcement has been put in preparation, it has developed that a great many imitations are springing up, owing to the wonderful selling ability of WONDER-MIST.

Don't Be Fooled by the Many "Mist" Adaptations of Wonder-Mist. Wonder-Mist Is the Originator,

and has been on the market for over two years. It was the first preparation of its kind to be used on automobiles and is backed by substantial New England business men. We solicit correspondence from all dealers as to our integrity and ability to fulfill any contracts made with us.



Do you know about our Window Display Sales Help agreement? It spells Opportunity with a big "O" and the "tune" in this "Opportunity" is the tune of profits—good, clean, legitimate profits.

Here is the store window of a Philadelphia dealer—a dealer whose business policy is based on *courtesy* and *service*, a dealer who knew opportunity when it knocked at his door—a dealer who has been successful and who now is reaping the benefits our WONDER-MIST Window Display Sales Help agreement brings.

THE STORE WITH THE WINDOW DISPLAY



You can do the same in your territory. If you haven't received this agreement, write or wire for it today. **WONDER-MIST** is the original and best cleanser for

all highly polished wood or metal surfaces. It is applied to automobile bodies by means of a sprayer and does its work of renewing the original lustre of the car's finish without the aid of water or laborious polishing.

Applied by sprayer in the form of mist—wiped off with a piece of soft cloth—no water—no labor—but the car looks like new—free from all the dust, dirt, oil or grease that may have collected on it—all in less than fifteen minutes.

Economical—Safe—Effective—Non-Inflammable—Non-Combustible. Wonder-Mist is both fast selling and profitable

THE WONDER-MIST COMPANY

General Offices:
14 Federal St. Boston, Mass.

New York Office:
1789 Broadway, New York, N. Y.

When Writing to Advertisers, Please Mention Motor Age



One quart of WONDER-MIST—with which the sprayer is given free—sells for \$1.25 and is ample for from ten to sixteen cleanings. Also supplied in half-gallon cans—\$2.00, and gallon cans—\$3.00.

SAXON "SIX"

With Detachable All-Season Top



Complete, including both all-season top and touring car top—\$935.

Closed Car Luxury at Touring Car Cost

Now—to countless men and women—the door swings open to enclosed car luxury—to its varied pleasures and privileges. The last barrier—that of cost—is swept away by the coming of this **all-season Saxon "Six" at \$935.**

Among enclosed cars of fine quality this marks the record low price. And it includes the *touring car* top as well as the detachable *all-season* top. So—for but \$150 more than the cost of the Saxon "Six" touring car—you really get three cars.

Three Fine Cars for the Price of One

First—**FOR WINTER MONTHS**—you have a luxurious enclosed car. The detachable top is designed with matchless skill. Its graceful contour blends harmoniously with the yacht-line beauty of the body.

Then—**WHENEVER YOU LIKE**—you can remove the sides of the **ALL-SEASON** top and have a touring car with a permanent top—a type of body of growing popularity.

Finally—**FOR FAIR WEATHER**—you can have an open touring car. Simply lift off the **ALL-SEASON** top and substitute the touring car top.

Look for These Class Car Attractions

SIX-CYLINDER high speed motor. In power, speed, flexibility, acceleration, hill climbing, quietness, smoothness, and coolness under all conditions Saxon "Six" greatly surpasses—we believe—any car of like price.

YACHT-LINE BEAUTY. Saxon "Six" exemplifies the latest vogue in body design.

TWO-UNIT electric starting and lighting system of utmost efficiency.

TIMKEN AXLES and **TIMKEN BEARINGS** throughout the chassis. Silent helical bevel drive gears. Improved body finish. Linoleum covered, aluminum bound running boards and floor boards. And a score more of noteworthy features.

Go see the new Saxon "Six" with all-season top at your local dealer's.

"Six" Touring Car.....\$785
 "Six" Roadster 785
 "Six" Touring Car with detachable all-season top—touring car top included.. 935

Saxon "Four" Roadster \$395

The Saxon "Four" Roadster is the greatest two passenger motor car value on the market. Note these attractions—Three speed selective transmission; Saxon high-speed motor—Timken axles—Hyatt Quiet bearings; Ventilating windshield; Signal lamps at side; Streamline body; Vanadium steel cantilever springs; Adjustable pedals; Honeycomb radiator; Dry plate clutch; and fifteen further refinements. Saxon Roadster costs only one-half cent per mile to operate. See this car at the nearest Saxon dealer's.

Standard Roadster, 4 cylinder, \$395. (Electric starting and lighting, \$50 extra)

Standard Roadster, with detachable coupe top—open roadster top included—\$455

Delivery car, three speed transmission, \$395

Saxon Motor Company Detroit Michigan

Dealers: Upon request we will send you our magazine "Saxon Days" and our dealer's proposition, providing your territory is open. Address Dept. M.



(212)

IT'S A WINNER IN ITS OWN HOME TOWN



"Night photograph" of illuminated sign 20x50 ft., maintained by Thompson Auto Co., Detroit, dealers in Commerce Motor Trucks, on Woodward Ave., "Detroit's Famous Motorway."

Dealers This picture tells its own story of the success of a Commerce dealer, located, as you know, in the "hot bed" of competition, for nowhere in the country are sales more keenly contested or a larger number of dealers engaged in the sale of commercial vehicles.

The Commerce Truck

Leads All the Rest in Sales in Detroit

With the **Commerce** agency **you** can duplicate these sales records in **your** home town. Perhaps we are not represented there today.

Write for our Dealer's Proposition

COMMERCE MOTOR CAR CO.

DETROIT, MICHIGAN



DODGE BROTHERS MOTOR CAR

Spoken advertising is by far the most powerful factor in the extraordinary demand for this car.

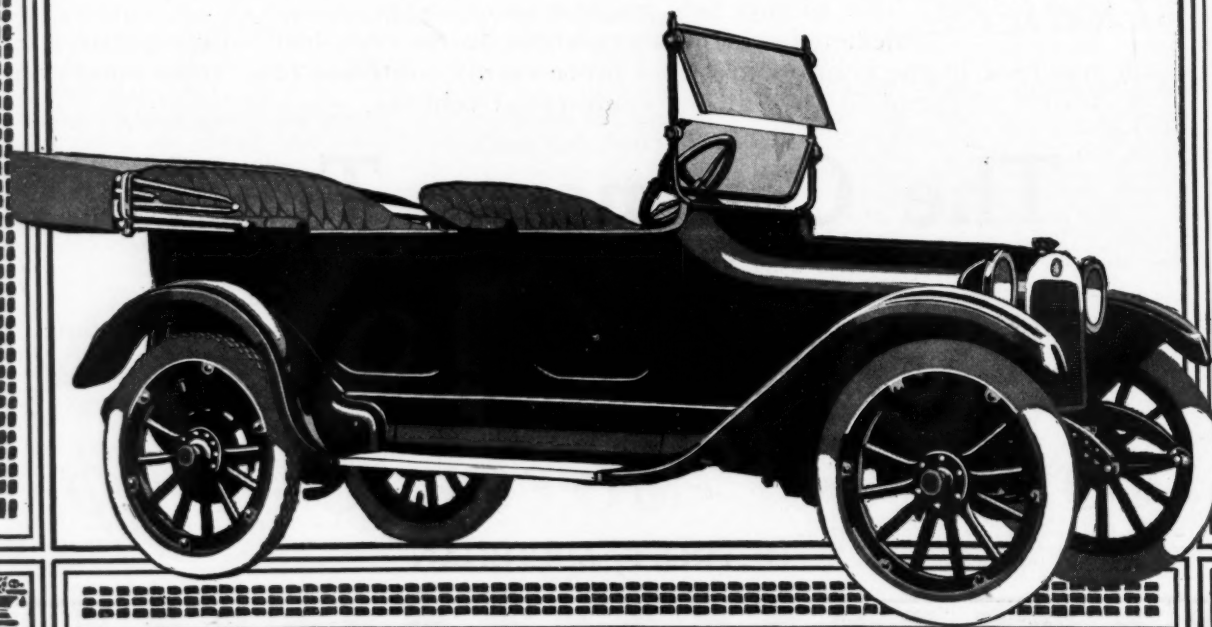
Unsolicited letters of enthusiastic approval continue to pour in from every state in the Union.

The motor is 30-35 horsepower

The price of the Touring Car or Roadster complete is \$785 (f. o. b. Detroit)

Canadian price \$950 (add freight from Detroit)

DODGE BROTHERS, DETROIT



When Writing to Advertisers, Please Mention Motor Age

Increase Your Delivery Efficiency and Profits Increase in Proportion

Better business this winter will follow in the path of better service. Install motor car delivery, increase your field of business operations, quicken your delivery schedule—and profits will take care of themselves.

Convert your Ford car into a business getter by equipping it with a HENNEY Commercial Body.

HENNEY Commercial Bodies on Ford Chassis Bring Paying Trade Into Your Store

Supplied in eight different styles—No. 200, Steel Panel Body (illustrated below), at \$99—No. 210, Steel Panel Body at \$84—No. 220, General Utility Body with top and flareboards, at \$67.50—No. 230, General Utility Open Body, with flareboards at \$45 (top and extra seat can be supplied—No. 240, Steel Panel Roadster Box, at \$24—No. 260 Open Flare Board Run-about Body at \$18.75—No. 250,

General Utility Body with top, removable side seats and rear steps at \$90. All prices F. O. B. Freeport.

Made of best materials by trained workmen. Guaranteed to outlast other bodies and stand up under most severe service.

Write us your requirements and let us recommend the style of body best suited for your needs. Send for free illustrated circular.

Dealers—HENNEY Commercial Bodies for Ford chassis sell fast at good profit. Will fit used chassis taken in trade. Turn over stock fast. Write for special discounts and details.

\$18.75 to \$99
F. O. B. Freeport

Henney Buggy Company
Freeport, Illinois

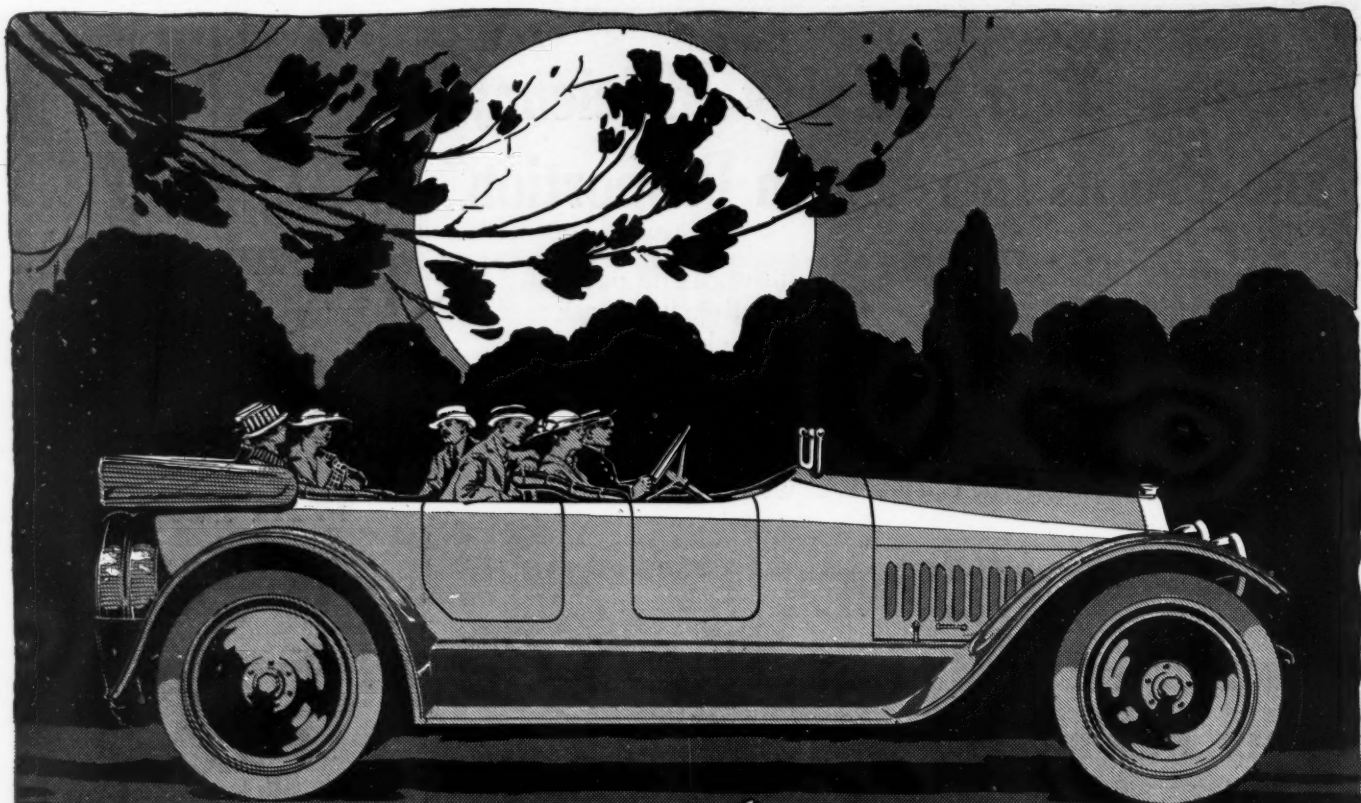
$\frac{1}{4}$ the Hired Help
 $\frac{1}{4}$ the Stabling Room
24 Hours a Day
Service
Every Day in the Week



No. 200, steel panel body, panels of specially prepared 20 Gauge auto steel, sand blasted before painting. Double doors fitted with large glass in upper panel and substantial locks. Solid slatted roof, covered with best grade rubber cloth. Neatly upholstered.

When Writing to Advertisers, Please Mention Motor Age

One
Henney
Commercial
Body on
Ford Chassis
Will Handle
Your Winter
Delivery Service
Quicker
Safer
Surer
Than Four
Horse-Drawn
Vehicles



National

"HIGHWAY"

6 \$1690
12 \$1990

Why?

Why have National sales increased more than 50%?

Why have double the number of business men learned the wisdom of becoming National dealers?

Why is every National owner proud and enthusiastic?

Why has the National factory been forced to erect new buildings to care for the steady increase in business?

Are you a car owner? Then write and we will tell you why. It will save you money.

Are you a dealer? If so, write us. It will make you money.

The "Why" is not a happen-so—it is the logical and inevitable result. Write today.

NATIONAL MOTOR VEHICLE CO.
INDIANAPOLIS, INDIANA



No. 4 in the
Plain Tube
Series

ZENITH

In an authoritative statement by a leading maker of automatic air valve carburetors published in our last advertisement it was stated that the air valve worked in opposition to a spring and that it was objectionable, like all moving parts, as it is liable to get out of order. This is decidedly a frank expression of inherent defects.

"Opposition" means to restrain or defeat a purpose. The motor, in its efforts to "breathe" freely, must overcome the tension of a spring or the weight of a valve to draw in the necessary oxygen for combustion. You would never dream of thus restricting your lungs in their breathing. Your efficiency would drop. A motor, likewise, must breathe deeply and without restraint. An open intake of the plain tube type is far better for results.

The objection that the automatic air valve was liable to get out of order was well taken. Springs will weaken, valves will stick, or flutter and hammer out

their seats. Dashpots will collect grains of dirt and stick, while cams will wear in time and make accurate results impossible. Besides, with such complication the human element must be figured. The inquisitive amateur and his adjustments are notorious.

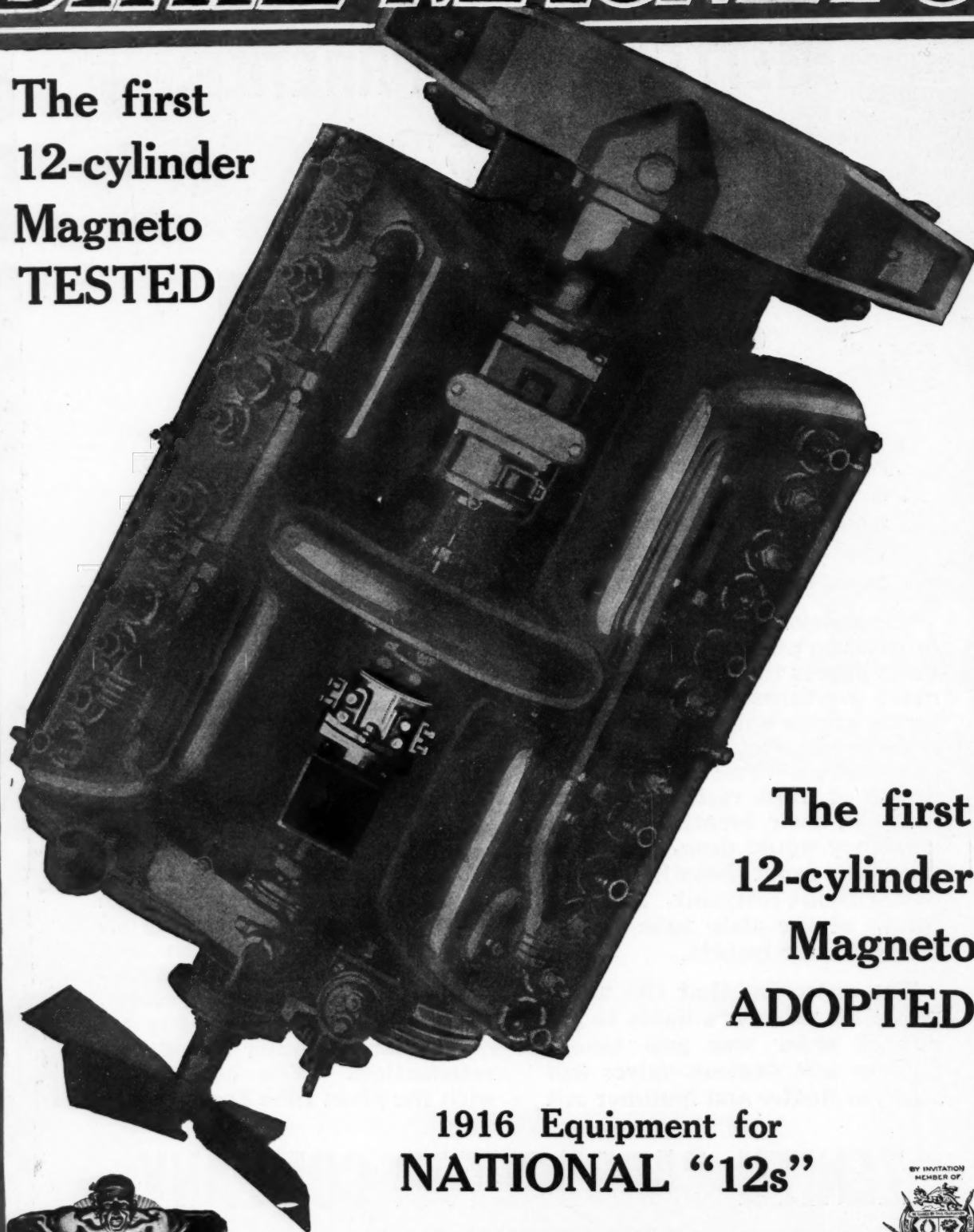
The simple plain tube Zenith is directly opposite in design from these defects. Having no moving parts to weaken and eventually give trouble it is permanent in action and results. This is the one big quality required for customer and dealer satisfaction. You can get it with the plain tube Zenith.

ZENITH CARBURETOR COMPANY

DETROIT, U. S. A.

DIXIE MAGNETO

The first
12-cylinder
Magneto
TESTED



The first
12-cylinder
Magneto
ADOPTED

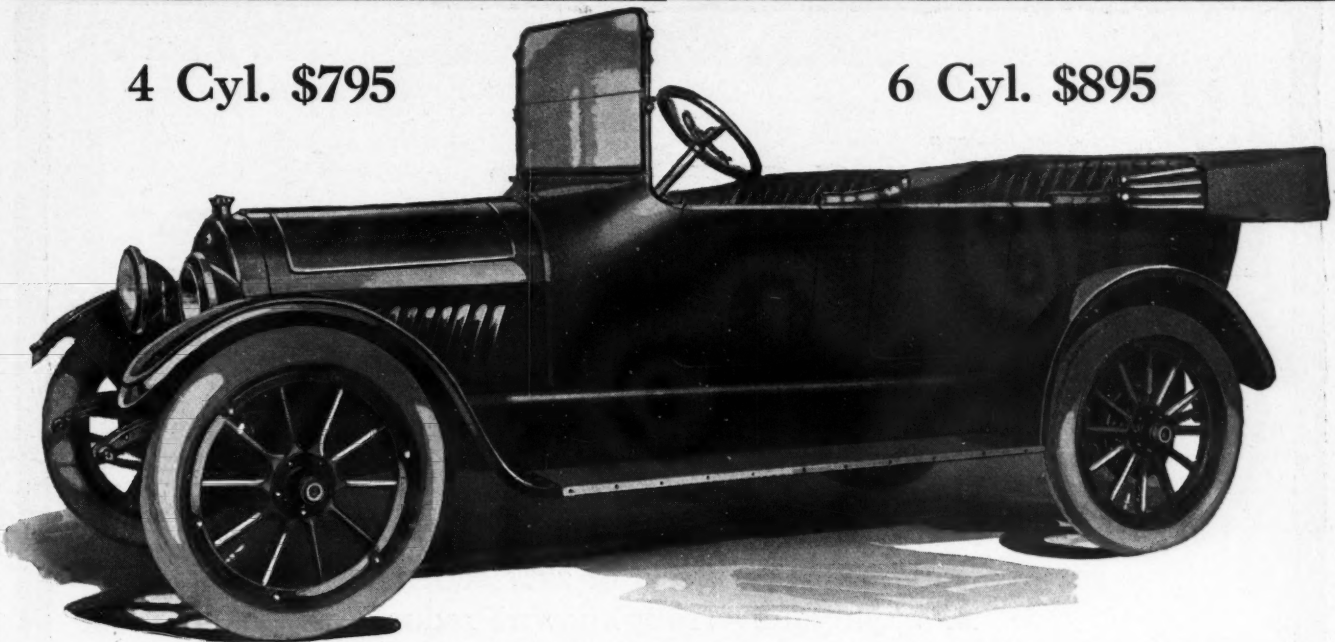
1916 Equipment for
NATIONAL "12s"

SPLITDORF ELECTRICAL COMPANY
Newark, N. J.



4 Cyl. \$795

6 Cyl. \$895



A battleship named Monitor surprised the world and revolutionized battleship construction. So its namesake, the

MONITOR

has furnished a surprise in simplicity of automobile construction and excellence in service.

Specifications Monitor 4-30

Unit Power Plant
Magneto—High Tension
Carburetor—Float Type
Self Starter—Electric
Electric Lights
Control—Center
Drive—Left Hand
Bearings—Hyatt Roller
Top—One Man Mohair
Springs—Tuthill
Equipment—Complete
Wheelbase—108"
Roadster or Touring
\$795

Construction

Monitor construction embodies the use, only, of such parts as are of known merit and built by manufacturers of established reputation and financial stability. There are 350 parts less than in the average car—simplicity.

Service

The continuous hard usage of many drivers has proved the wisdom used in selection of parts and the small expense of service has increased the dealer's profit.

Sales

The unsurpassed beauty in appearance, the exceptional finish of the smallest details, combined with an unusually easy riding quality and surprising hill climbing ability has rendered easy sales for the dealers and a constant source of satisfactory service for the owner.

Specifications Monitor 6-40

Unit Power Plant
Electric Generator and Starter
Electric Lights
Carburetor—Latest
Float Feed Type
Gasoline supplied by
Vacuum System
Control—Center
Drive—Left Hand
Top—One Man Mohair
Springs—Semi and $\frac{3}{4}$
Elliptical, extra length
Wheelbase—115"
Weight—2400
Price—\$895

Line is complete—Write for specifications—Reasonably prompt deliveries—
Most liberal terms to distributors and dealers in open territory.

The Cummins-Monitor Co.
402 Mt. Vernon Avenue, Columbus, Ohio

It's the Name that Tells

THERE'S a world of satisfaction in buying universally known Products.

It inspires immediate confidence when you look into a hat and see the name "Dunlap",—at a watch and see the name "Howard". Similar names could be mentioned by the dozen.

You don't have to be told about the quality of such products.

In every line of merchandise there's a name that stands out above all others.

When it comes to automobile accessories the name "Stewart" means everything—Prestige, Quality, Service and Satisfaction—and Stewart Products cost you no more than the unknown makes.

Stewart Speedometer
MAGNETIC TYPE
for FORD Cars - \$12



Stewart-Warner Speedometer Corporation, Chicago, U. S. A.

\$9

5

DEALERS:
We Can Still
Accommodate
a Few More
of You

HOLLIER**EIGHT**

Dealers who have had their ears to the ground realize that 8-cylinder construction is here to stay—that the multiple cylinder movement is progressing by leaps and bounds. Progressive dealers know that right now it has pretty nearly come to a case of either handling an 8-cylinder car or losing the ever-increasing eight business to someone else.

Deal Direct with Factory

Our 1916 proposition eliminates the distributor entirely. The extra profit goes to **HOLLIER** dealers. You get full advantage of every sale you close—no one else to cut in and share the profits **YOU** have worked for and which **YOU** alone have earned.

You get your territory direct from us—you get your cars direct from us—you get co-operative service that you can bank on direct from us.

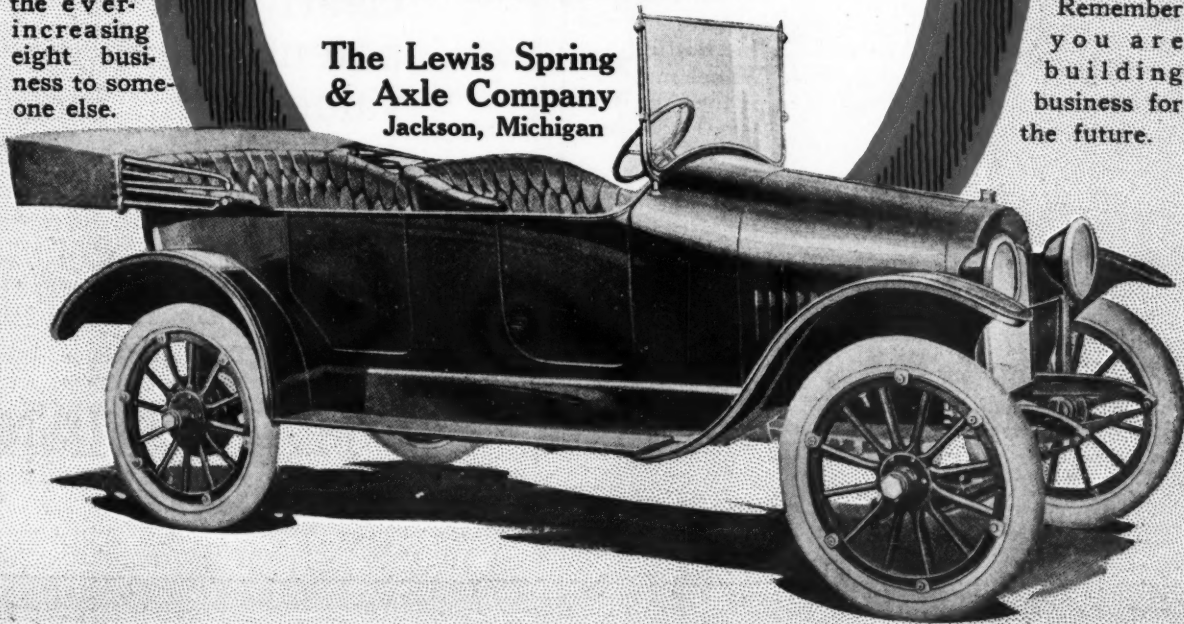
Leading dealers are lending their fullest support to this new **HOLLIER** plan. Everywhere they are rallying to the **HOLLIER** standard in what promises to be one of the most successful campaigns of the year. If you are dissatisfied with present conditions—feel you are not getting your due—we can surely interest you. Some territory still open. It may be taken tomorrow, so act now. **WRITE OR WIRE US.**

**The Lewis Spring
& Axle Company**
Jackson, Michigan

It requires very little foresight to see where the profits for 1916 are to be.

The next three or four years are going to be 8-cylinder years, and the dealer who figures this out **NOW** is the man who is going to profit.

Remember you are building business for the future.



When Writing to Advertisers, Please Mention Motor Age



The Winner
J. Mullane
 146 Windsor St.
 Halifax, N.S.
 CANADA

A Story of a Picture

Warfare in this, the twentieth century, represents a marvel of scientific and mechanical innovations, and the present conflict has demonstrated beyond a doubt the effectiveness of these devices.

The practicability of those modern instruments of war to accomplish what would seem to be impossible feats of action is vividly portrayed in the picture "QUICK CHANGE," wherein the HOUK DETACHABLE WIRE WHEEL is being successfully operated under strenuous conditions.

Napoleon would indeed be conqueror of the world had he such in his battles. The Houk Detachable Wire Wheel may be well termed the Napoleon of the Age.

J. MULLANE
 146 Windsor Street,
 Halifax, N. S., Canada

*The
 Winning
 Story*



Announcing the

HOUK "QUICK CHANGE" **WIRE WHEEL** **CONTEST**

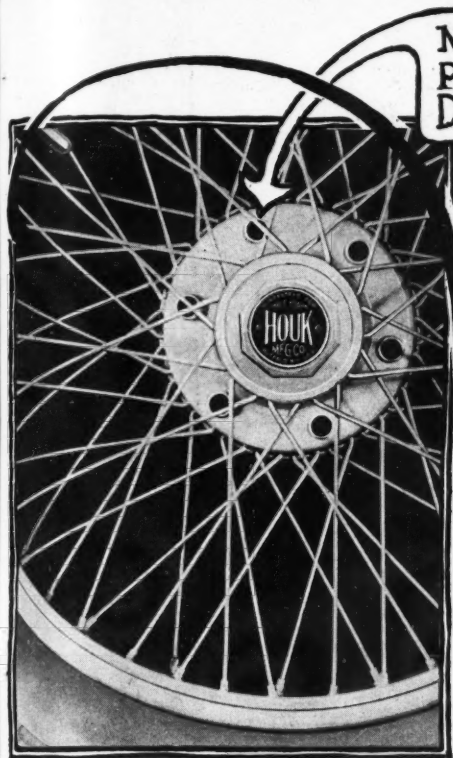
No picture in recent times has attracted more attention, or created more comment than this now famous picture showing "Wheels changed under Fire."

No picture could more clearly illustrate the potential and practical value of this indispensable device.

Mr. Mullane's Story, to quote from the decision of the judges, Mr. David Beecroft, Editor of Motor Age, and Mr. E. G. West-

HOUK MANUFAC
BUFFALO,

NOTE THE
POWERFUL
DRIVING LUGS



Winner

Mr. Beecroft says that, "There were some others which had particular merit, namely,

Kenyon A. Joyce, which had good literary movement but lacked imagination.

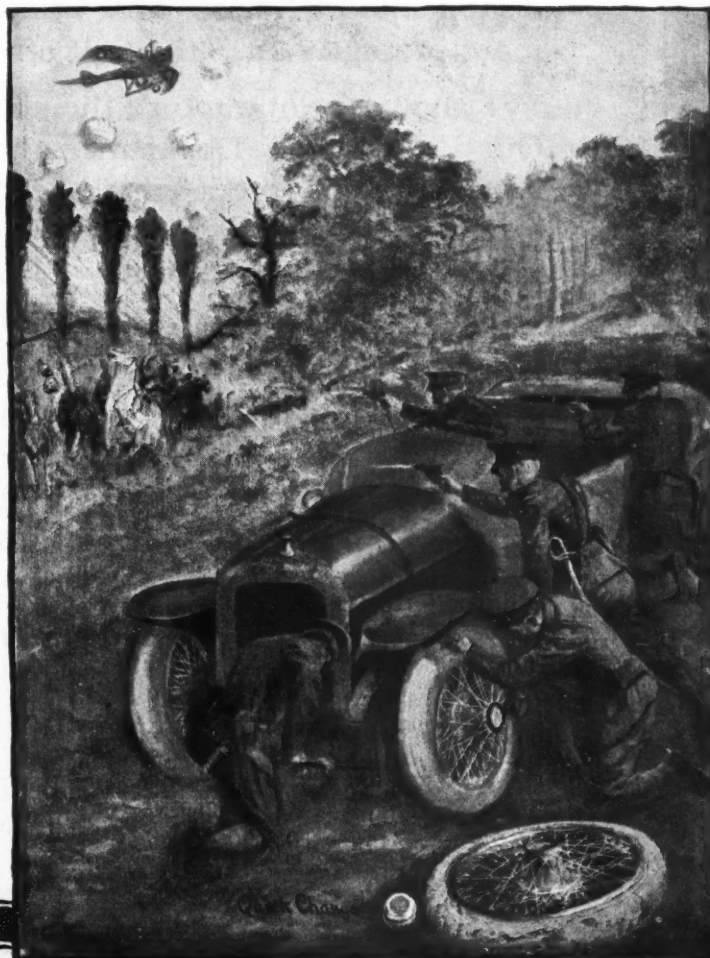
McDowell, who brought out the conception of time meaning life in exigencies of this nature.

Jos. McMann, who had the thought of invention very well in his mind but not on a par with J. Mullane.

H. R. Griest, whose answer from a literary standpoint was well worth attention.

Thos. C. Hill, who had some good thoughts but had the conception of time only in his mind."

The Famous Picture



lake, of the Chicago Evening Post, "has linked the mechanical achievement of the age with the greatest military genius in history in a novel, unique and wholly original manner." It was this unique combination which won for Mr. Mullane the prize, one full set of Houk Wire Wheels.

Houk Wheels with their terrific strength, their immediate interchangeability in case of tire trouble, their trueness, their roundness, their beauty and their unapproachable utility makes them indispensable on all fast military cars and on all high class well appointed pleasure vehicles.

TURING COMPANY
NEW YORK



Hudson EXPANSION

The demand for Hudson cars continues to increase with significant rapidity. The Hudson is a leader of fine cars in number of sales. Last year the capacity of the Hudson factories was doubled, but the demand overtook the output. This year the capacity is being doubled again, at an expense of \$1,500,000. We intend that no one shall be disappointed. Those who want Hudsons can get them more promptly after the first of the year.

We shall continue to use the six-cylinder type of motor. Our Engineering Department has tried out every other type of motor, to determine beyond a doubt whether a better type was possible for use in pleasure vehicles. Their research leaves us even more firmly convinced of the absolute supremacy of the Hudson six-cylinder motor.

Hudson cars are built in seven styles of bodies. Hudson bodies have achieved the distinction among bodies which the Hudson motor has won among motors. The closed bodies are conceded to be the finest ever produced at prices at all comparable. They have created an enormous sensation.

Buyers of Hudson will secure in the future, as they have in the past, the results of the highest engineering and artistic development that the industry offers.

HUDSON MOTOR CAR COMPANY
DETROIT, MICHIGAN

USL

U.S. LIGHT & HEAT CORPORATION

BATTERIES

THE absolute superiority of the marvelous *USL machine pasted battery plate* has been proved beyond question.

In thousands of motor cars *USL* starting and lighting batteries with machine pasted plates are outlasting, sometimes two and three to one, batteries equipped with the old type of "hand-pasted" plates.

USL machine pasted plates contain no flaws. They do *not* "wash" away. They do *not* crumble or break down under road shock or vibration.

USL plates are placed in an ingenious machine and the oxide paste is pressed in from both sides *at once*. It is pressed in evenly and compactly. It "sets" as a mass and the result is a solid plate, equal in density all the way through, which gives off a steady, constant, *dependable* flow of power, wears evenly, stands up under hard service, and *lasts longer than any other starting and lighting battery plate in the world*.

Equip your car with a USL. Sold under a fifteen months' guarantee. Free service inspection as often as required

U. S. Light and Heat Corporation, Niagara Falls, N. Y.

Branches: New York Buffalo Detroit Chicago Cleveland
 St. Louis Boston Washington San Francisco

Here is a remarkable opportunity for dealers. We give exclusive territory rights to the right men.



Service stations maintained in every section of the country

As Necessary for Motor Cars as for Battleships—

Battleships use searchlights as giant "feelers" to acquaint the night watch of approaching danger. The ship rests secure in a mile-wide circle of safety—protected itself and a protection for others on the highways of the sea.

Yet motor cars, open to quick and sudden emergencies of the road—dangers from every side—and potentially engines of death and accident, are allowed to operate freely with only the meagrest sort of protective lighting equipment.



Laws *compelling* motorists to use searchlights, for their own safety and for the safety of others, are imminent.

Take it for fact that if the 2,000,000 cars in this country were equipped with FOSTER Owl Lights, night accidents would fall off 75%.

It's better to have an OWL than to wish you had. One accident averted pays for the OWL Light many times over, while the feeling of absolute security you enjoy is worth many times its purchase price.

Complete, ready to put right on, \$7.50. Fits on windshield of any car. Operates from storage battery. Handsomest—lightest—best constructed—most durable. The only light guaranteed to stay in any position you put it—a feature made possible only by the patented FOSTER Universal Swivel Joint.

New
Foster
Universal
Bracket



Note Improved Foster
Universal Swivel

Write for Free Booklet

In ordering state
make and model of
car and battery
voltage.

Dealers Wanted
Everywhere

**C. H. FOSTER
ACCESSORIES
COMPANY**

Manufacturer
and Distributor of Motor
Car Accessories

2303 Michigan Ave.
Chicago, Illinois

When Writing to Advertisers, Please Mention Motor Age



Seventy Horse Power—Seven Passengers

An "Eight" of the highest rank. Compare it with cars costing \$200 to \$300 more

In every way Model "68" Jackson is the finest car we have ever built. It has the finest motor; the finest chassis; the finest body and the finest finish. It has the most complete equipment. It is the most notable in performance, the most comprehensive in luxury.

Jackson Quality PLUS Jackson Experience, PLUS these Features

124-inch wheelbase.
High duty balanced motor.
Eight cylinders, $3\frac{1}{2} \times 4\frac{1}{2}$ "L" type cylinders with removable heads.
Three-bearing crankshaft, $2\frac{1}{8}$ inches diameter.
Tungsten steel valves.
Direct, positive lubrication to all bearings.
Dash oil pressure gauge with adjustments.

Full floating rear axle.
Brake drums 2×14 inches.
Cone clutch, with flexible pressed steel spider.
Electric auto-lite starter with Bendix drive.
Four full elliptic springs.
15-gallon gas tank.
Stewart vacuum fuel system.
 $34 \times 4\frac{1}{2}$ inch tires. Non-skid in rear.

Moulded body—long, low, rakish appearance—large tonneau.
Extra seats fold into front seat back.
Press-the-button door openers.
One-man top.
Mechanical tire pump.
Electric horn.
Electric lights.
Electric starter.
Dark blue finish.

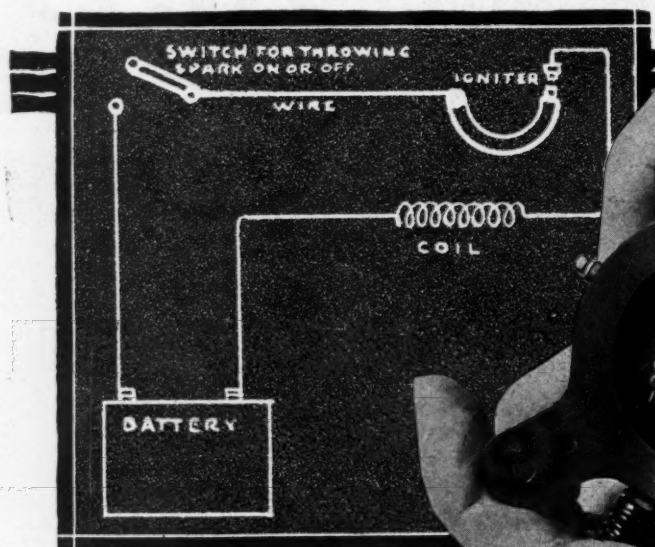
The Jackson line also includes Model "34" Four, \$985, and Model "348" Eight—a light eight at \$1195

Dealers: The great selling values of these new Jacksons mean quick sales. We suggest quick action if we are not already represented in your territory.

Jackson Automobile Co. 1207 East Main Street **Jackson, Michigan**

When Writing to Advertisers, Please Mention Motor Age

Simplicity



Employing the simplest form of electrical circuit controlled by direct and positive mechanical action.

AUTOMATIC · IGNITION CONNECTICUT

eliminates every menace to synchronous firing and tempers the quality of its spark to agree exactly with the motor's requirements at any and all speeds.

CONNECTICUT TELEPHONE & ELECTRIC COMPANY, Inc.

MERIDEN

Ford Dealers—Write for information regarding Connecticut Automatic Ignition for Ford Cars—A. J. Picard & Co., Sole Agents, 1720 Broadway, N. Y.

When Writing to Advertisers, Please Mention Motor Age

CONN.

The Jeffery Four Sedan

COMBINING
WINTER LUXURY WITH
SUMMER COMFORT

(The top is removable)

PRICE COMPLETE

\$1165



THE JEFFERY FOUR SEDAN
(Top Removable)

FIVE-PASSENGER, \$1165
SEVEN-PASSENGER, \$1200

TOURING CAR

SEVEN-PASSENGER, \$1035 · FIVE-PASSENGER, \$1000

THREE-PASSENGER ROADSTER, \$1000

THE JEFFERY SIX, \$1350

Picture to yourself a handsome, high-grade, beautifully-finished, luxuriously easy-riding enclosed coach—put as much quality into your picture as you can—and you still will not be overestimating the quality and appearance of the Jeffery Four Sedan. Yet the cost of this car complete is extremely moderate—and the Sedan body is easily removed, giving you an open touring car including summer top for pleasant-weather touring.

Divided front seats afford easy access from the front compartment to the tonneau. Windows, extra wide, three-sixteenth inch crystal plate, ground and polished, adjustable for ventilation. Curtains, silk portiere type. Upholstery, grey whipcord—leather optional for seats. Interior illumination from an electric dome light.



Prices F.O.B.
Kenosha, Wisconsin

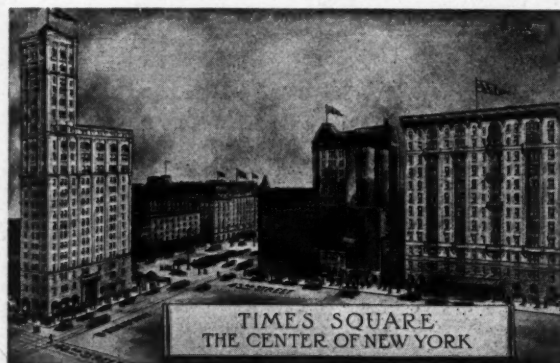
The Thomas B. Jeffery Company
Main Office and Works · Kenosha, Wisconsin

Illustrated booklet
on request



HOTEL WOODSTOCK

TIMES SQUARE, NEW YORK



Near enough to the center of New York for business or entertainment — retiring enough for business, The Woodstock offers Automobile men the exceptional advantages of a wonderful location and an efficient equipment at reasonable rates.

Rooms—Single Bed and bath for one.....\$2.00 to \$3.00

Rooms—Two beds and bath for two.....\$4.00 to \$5.00

Suites arranged to your convenience.

W. H. VALIQUETTE, Managing Director

WRITE FOR OUR MAP OF NEW YORK

A. E. SINGLETON, Ass't Manager

Lack of Knowledge Is Expensive

“THE AUTOMOBILE CATECHISM” (de luxe edition) is a complete course in automobile instruction—each subject discussed and illustrated so that YOU will grasp every point worth while—every subject is made as simple as A B C. You are interested—you are instructed—you are directly benefited. Its information is final.

It's a handsome piece of book work—splendidly printed, with 101 illustrations; flexible black leather binding, rounded corners and gold-edged pages—beautiful, while being intensely practical. It will be to your immediate financial advantage to acquire an intimate and practical knowledge of cars and their parts.

We want every reader of Motor Age to have a de luxe copy of “The Automobile Catechism.” To make our offer irresistible we have decided, for a limited time only, to cut the price in two. This half price (\$1.25) will prove the best investment you ever made. Remember, this is the de luxe edition—264 pages—every page full of real, money-interest value.



Special
Price
\$1.25

Regular Price \$2.50

Don't delay, send
for this book today

THE CLASS JOURNAL COMPANY
910 S. Michigan Avenue Chicago, Ill.

A Service That Eliminates Expense

How to Get Better Performance from Your Starting and Lighting System.

You probably realize how much of a factor your storage battery is. And you also realize how important it is to keep it in good condition.

We're going to help you do this free of charge or obligation of any kind.

All you do is to make the request. We'll send you a card that entitles you to free battery inspection at any Willard Service Station once each month for a year.

At the same time we'll send you two booklets of interesting and valuable information on how to tell when a storage battery is good and how to keep it good.

*Simply ask for Bulletin R-11
when you write.*

Willard Storage Battery Company Cleveland, Ohio

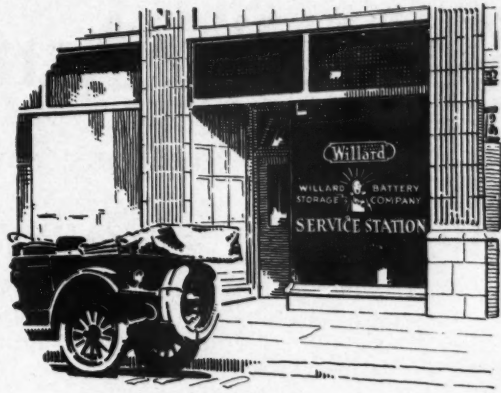
New York: 228-230 W. 59th St. Detroit: 736-40 Woodward Ave.
Chicago: 2524-30 So. Wabash Ave. San Francisco: 1433 Bush St.
Atlanta: 8-10 East Cain St. Oakland, Cal.: 2509 Broadway
Indianapolis: 318 North Illinois Street

Direct Factory Representatives in:

Philadelphia Boston Dallas Kansas City Omaha Minneapolis

Service Stations in all Principal Cities in the United States,
Canada and Mexico

Willard STORAGE BATTERY



Over 500 service stations where expert service is assured.

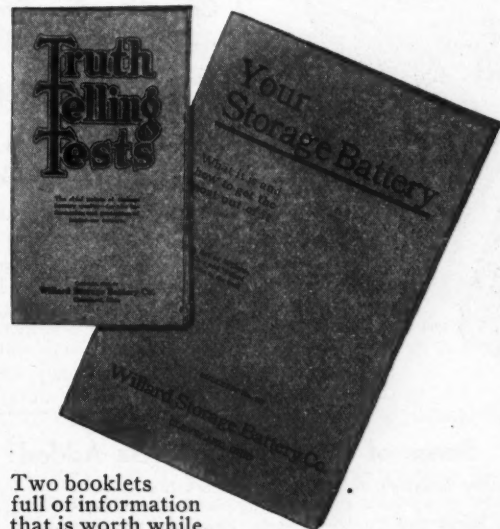
AT ANY WILLARD BRANCH OR SERVICE STATION ANYWHERE

Mr. Jack Speedwell
Is entitled to FREE INSPECTION each month, of the Storage Battery on his car.

Date Issued *10/1* **Willard** 191*5*

JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
------	------	------	-------	-----	------	------	------	-------	------	------	------

A card that helps to give you better starting and lighting.



Two booklets full of information that is worth while.



The Only Tool You Need

If you haven't already learned the advantages of a hydrometer syringe for finding out the condition of your battery, enclose a dollar and we'll send you this indispensable accessory. You can't get one at such low cost elsewhere.

Audel's Automobile Guide

WITH
Questions, Answers and Illustrations
FOR

OWNERS

OPERATORS

REPAIRMEN

Relating to The Parts, Operation, Care, Management, Road Driving Carbureters, Wiring, Timing, Ignition, Motor Troubles, Lubrication, Tires, etc.

Including chapters on the Storage Battery, Electric Vehicles, Motor Cycles, Overhauling the Car and an Appendix on Self Starters and Lighting Systems.

By GIDEON HARRIS and Associates

A Book Worth Having "UNDERSTAND YOUR CAR"—
Explained in the following chapters:

1. Ready Reference Index.
2. The Automobile.
3. The Gas Engine.
4. The Cycle of a Gas Engine.
5. Brief Outline of Gas Engine Principles.
6. Cooling Systems.
7. Fuels.
8. Carbureters.
9. Ignition.

10. Timing and Balancing.
11. Gas Engine Operation.
12. Clutches.
13. Transmissions.
14. The Drive.
15. The Differential.
16. The Running Gear.
17. Tires.
18. Brakes.
19. Ball and Roller Bearings.

20. Lubricants and Lubrication.
21. Motor Cycles.
22. Electrics.
23. Electricity.
24. Dynamos and Motors.
25. Storage Batteries.
26. Methods of Circuit Changing.
27. How to Run an Automobile.
28. Overhauling the Car.
29. Starters and Starting Systems.
30. Electric Lighting and Wiring.

550 Illustrations,
700 Pages, Flexible
black leather
binding.

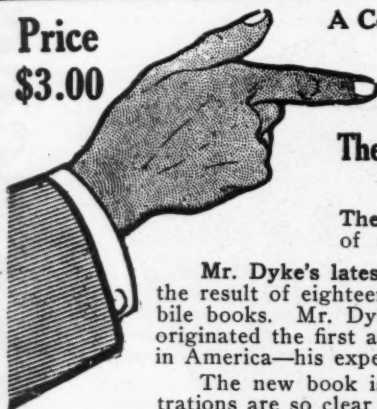
PRICE
\$1.50

Postage Paid

ORDER FROM BOOK DEPARTMENT.

MOTOR AGE, 910 South Michigan Avenue, CHICAGO, ILLINOIS

Price
\$3.00



A Complete, Simplified, Practical Book on Everything Pertaining
to Automobiles in the World

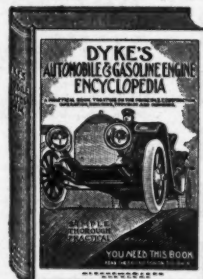
Enlarged Revised Edition Now
Ready

The Late Edition Is Improved at Least One Hundred Per Cent
With a Complete Ford Instruction Added

The First Practical Automobile Book was, "Dr. Dyke's Diseases
of a Gasoline Automobile and How to Cure Them"—1900

Mr. Dyke's latest book; Dyke's Automobile and Gasoline Engine Encyclopedia, is the result of eighteen years' practical experience and fifteen years of publishing automobile books. Mr. Dyke also built early models of both gasoline and electric machines, originated the first auto supply business and manufactured the first float feed carburetor in America—his experience is worth something to you.

The new book is so thoroughly simplified anyone can understand—in fact, the illustrations are so clear and minutely detail you hardly need refer to the text.



A teacher, guide and reference on everything pertaining to motoring. Simple as the A B C's. It's worth ten times its cost if only placed on the shelf and used as reference. 1750 illustrations instead of 1200. 49 instructions instead of 40. 590 pages instead of 596.

Some of the New Subjects Added:

Electric Starters, Generators and Lighting Systems—up to date—see table of contents instruction number 25 to 32; also 19.

Six, Eight and Twelve Cylinder Engines. See Instruction 11.

Valve Timing and Ignition Timing—simplified so a ten year old boy can understand. See table contents, Instruction 9, 10 and 24.

A complete Ford Instruction.

Repairing.—This subject has been enlarged and greatly improved—many new subjects and illustrations added—everything you want to know from making a home-made magnet recharger to building and equipping a garage for home or business and how to make all repairs and adjustments in an intelligent manner.

You will understand how to diagnose troubles by a process of elimination—in other words you will become a real expert.

Over one hundred thousand Dyke books sold—not one returned—yet a two day trial examination is allowed.

Lack of space prevents a lengthy description, therefore see the table of contents and read the subjects treated.

ADDRESS
BOOK DEPT.

Motor Age
910 So. Michigan Avenue, Chicago

TABLE OF CONTENTS

	Page
1—THE AUTOMOBILE	1-17
2—DRIVERS	18-26
3—WHEELING, SPINDLE, BRAKES	27-30
4—AXLE DIFFERENTIAL ON COMPENSATING GEAR, BEARING	31-33
5—CLUTCHES	34-40
6—CHANGE SPEED GEAR ON TRANSMISSION	41-42
7—THE GASOLINE ENGINE	43-71
8—ENGINE PARTS	72-84
9—VALVE TIMING	85-110
10—FIRING ORDER	111-118
11—SIX, EIGHT AND TWELVE CYLINDER ENGINES	119-126
12—CARBURETOR	127-133
13—CARBURETOR ADJUSTMENTS	134-137
14—COOLING	138-139
15—LUBRICATION	140-146
16—IGNITION: LOW TENSION COIL	147-151
17—IGNITION: HIGH TENSION COIL	152-153
18—SPARK PLUGS AND COIL TROUBLES	154-157
19—THE MODERN BATTERY COIL IGNITION SYSTEM	158-162
20—A REVIEW OF THE VARIOUS COIL IGNITION SYSTEMS	163-168
21—LOW TENSION MAGNETS	169-172
22—THE HIGH TENSION MAGNET	173-174
23—CARS OF MAGNETS	175-176
24—IGNITION TIMING	177-178
25—ENGINE STARTERS	179-180
26—THE ELECTRIC STARTING MOTOR	181-182
27—THE ELECTRIC GENERATOR	183-184
28—DIFFERENT LEADING ELECTRIC STARTING AND GENERATOR SYSTEMS	185-187
29—CARS OF THE ELECTRIC STARTING MOTOR, GENERATOR AND LIGHTING SYSTEM	188-190

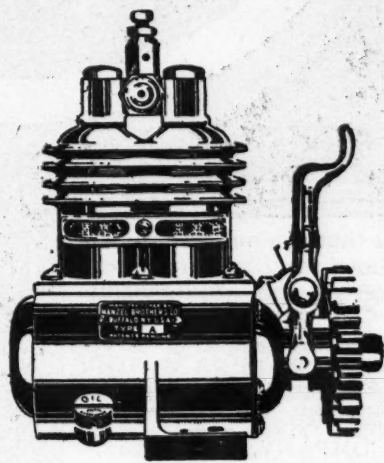
OF SUBJECTS TREATED IN THIS BOOK

30—WIRING FOR STARTING, GENERATING AND LIGHTING SYSTEMS	191-192
31—LIGHTING A CAR	193-194
32—STORAGE BATTERIES	195-196
33—THE ELECTRIC VEHICLE	197-198
34—OPERATING A CAR	199-200
35—SIGNAL OF THE ROAD	201-202
36—CARS OF CAR	203-204
37—ACCIDENTS TO VEHICLES	205-206
38—DISASTERS AND LIGHTS	207-208
39—THE AUTOMOBILE SALESMAN	209-210
40—DISASTERS	211-212
41—TILES	213-214
42—VOLCANISM	215-216
43—DUST OF TROUBLES	217-218
44—THE AUTOMOBILE REPAIRMAN	219-220
45—REPAIRS AND SHOP	221-222
46—REPAIRING	223-224
47—TRUCKS	225-226
48—TRACTORS	227-228
49—BRIEF TREATISE OF STEAM, ALSO, MOTORCYCLE, MARINE, STATIONARY ENGINES	229-230

Note the number of instructions and number of pages to each

When Writing to Advertisers, Please Mention Motor Age

NEW PRICE



The Manzel Two-Cylinder Engine Driven Tire Pump

Now only \$15.00

Including 15 feet of air hose, pressure gauge, gears, and bracket—everything ready to attach to car.

Complete attachments can be furnished for over 200 models of cars, including 1916 Buick, Chalmers, Chandler, Hudson, Oakland, Oldsmobile, Overland, and other cars.

DEALERS: Our 1916 Proposition is a money maker for you. Write for details today.

MANZEL BROTHERS CO.
306 Babcock Street, Buffalo, N. Y.



Can You Afford

to run your Ford this winter without a limousine top like this? The price is only \$60—Complete

Write for descriptive circular today.

The Wadsworth Manufacturing Company
1277 Jefferson Avenue, Detroit, Michigan

Dealers

There is a golden opportunity for the man who is prepared to supply the demand for Wadsworth all-season tops. The Ford is everywhere.

Write immediately for details of our Co-operative Dealer Plan. Liberal discounts to Wadsworth agents. Big profits are in store for wide awake men who act quickly.

Just a suggestion—the telegraph is quicker than the mails.

THE LONG LIFE MOTOR



EVERY manufacturer of a car or truck knows that if a motor has long life there is little else that needs be said about it. Long life necessarily implies that power, design, balance, materials and workmanship are all that they should be.

It is therefore with considerable pride that we offer to exhibit to you astonishing evidence of the exceptional durability of the BUDA MOTOR. It may mean much to you in maintaining permanent good relations with your trade to equip your output with BUDAS. May we show you?

Address: BRANDENBURG & COMPANY, Factory Reps.
57th & Broadway, New York
1112 S. Michigan Ave., Chicago. 1311 Dime Bank Bldg., Detroit

THE BUDA COMPANY - HARVEY CHICAGO SUBURB ILLINOIS

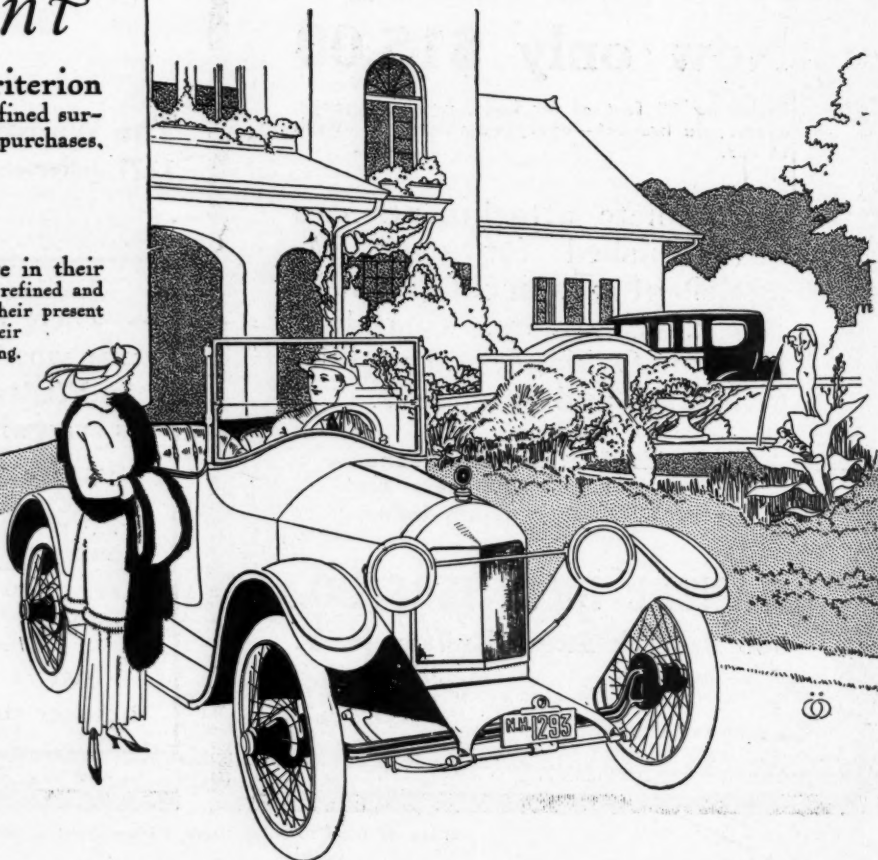
Environment

is an indication of quality, a criterion of standing. Refined judgments seek refined surroundings and demand refinement in all purchases.

Scripps-Booth

Scripps-Booth luxurious light cars have in their first season found their way into the most refined and exclusive society of America and Europe, their present environment of ownership being indicative of their quality and a criterion of Scripps-Booth standing.

*Scripps-Booth Company
Detroit Mich.*



Roadster \$775
Coupe \$1450

Rough Riding—Not Mileage—Wears Out Your Car

It's the **Rebound** that jolts you from the seat, shakes things loose, runs up big repair bills, makes your car noisy and drives it to the junk pile.

You can't help rough roads, but you **can** prevent rough riding by protecting against **Spring Rebound** with

GABRIEL SNUBBERS

Ask any user. Write for catalog

GABRIEL MFG. COMPANY, 1415 East 40th St., Cleveland, Ohio



Like the Bull in the picture, the harder the springs rebound, the tighter the layers coil to prevent it.



Prices

\$15, \$20, \$25 per set of four, two front and two rear; half that per pair.

The New Garford Hand Operated Warning Signal

Don't Trust a Battery Sound Your Own Warning Signal By Hand

Pushing an electric button to sound your warning signal takes the operation of your most used safety device out of your hands, and puts it at the mercy of a battery and delicate, unreliable connections.

Pushing the GARFORD 45° safety plunger makes you master of your warning signal. No connections but the touch of your hand. No power but the motion of your arm. Convenient as a push button—reliable as time—quick as thought. Never fails.

Ask your dealer.

Dealers

The Hand Operated GARFORD is the safest warning signal, at a price in reach of every owner of a motor car. Equally useful on the most expensive and cheapest cars. Sells alone or as a safeguard against imperfections in mechanically driven horns. Liberal discounts to dealers—and big sales. Nationally advertised. Write for particulars.

The Garford Mfg. Company, 2503 Olive St., Elyria, Ohio

Branch: The Garford Mfg. Co., Kansas City, Mo. Distributors: The Dean Electric Co., Seattle, Wash.; The Dean Electric Co., Los Angeles, Cal.; Sumter Telephone Supply Co., Sumter, S. C.

\$3.85

FLows FREELY AT ZERO

This is most important during winter months. You should know whether the oil you are using "flows freely at Zero." All oils do not possess this feature—notably the paraffine-base oils, which thicken up under cold, and often cause great damage to the motor.

The safe way is to ask for SUPREME AUTO OIL—it "flows freely at Zero", and leaves no carbon, owing to the fact that it is a Southern Asphalt-base Oil, containing no paraffine to gum, stick and thicken.

There is More Power in
THAT GOOD GULF GASOLINE and
SUPREME AUTO OIL

GULF REFINING COMPANY
Dept. 1875 Frick Annex, PITTSBURGH, PA.

Don't Throw Away Your Old Tires Run Them 4000 Miles More

Whenever two of your Ford Car tires wear out and are ready for the junk man—save them. Send them to us instead, and we'll ship you an IRONCLAD Double Tread Casing, guaranteed in writing to run 4,000 miles.

For Ford
Cars
Only

\$5.50
\$6.50
\$7.50

According to
size and style

Get Our
4000
Mile
Written
Guarantee



Easy
Riding
Practically
Puncture Proof

We Take Old Tires for Part Payment

Every old Ford car tire you own is worth money to you, applied on new IRONCLADS. Worn out casings are good for another 4,000 miles actual road wear, at half the regular price of new tires. Double thickness treads. Practically puncture-proof construction. Easy-riding and resilient as tires new from the factory. 30x3, plain, \$5.50; non-skid, \$6.50. 30x3 1/2, plain, \$6.50; non-skid, \$7.50. Send \$1 deposit on each IRONCLAD ordered, and same will be sent C. O. D., subject to your examination and approval. Write today for details and free circular—and pack your old tires ready to ship.

Dealers Wanted

IRONCLAD TIRE COMPANY
840 Jackson Boulevard, Chicago



Fits on
Windshield
or Fore door

\$3⁷⁵

Beautifully
Finished
Sturdily
Constructed
PRICED
RIGHT

May be attached to any make of car. Throws a brilliant spotlight in any direction. Put your car in the up-to-date class by installing one NOW.

Majestic Spotlight

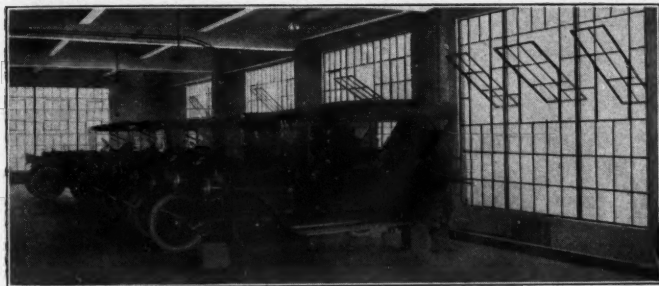
Dealers: Searchlights are the fastest selling accessory of the year. Everybody wants one. Sell on sight—with good profits. Write or wire for dealer's proposition—today. Immediate action necessary.

MAJESTIC MFG. & SPECIALTIES COMPANY
1355 Michigan Avenue Chicago, Illinois

SIMMS ^{High Tension} MAGNETO and SIMMS-HUFF Electric Starting and Lighting System

Automobile Engineers
unite in pronouncing
Simms Products "Elec-
trical Equipment Par
Excellence."

The SIMMS MAGNETO Co.
East Orange, N.J.



Garage Efficiency

Light lightens garage labor—makes for efficiency. Note how the Fenestra Sash construction of the San Francisco Pierce-Arrow Garage (shown above) day-lights the whole interior.

The mechanics in the garage work better, faster, easier.

Fenestra
SOLID STEEL WINDOWS

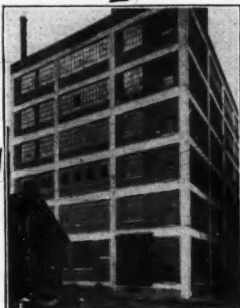
"REG. U.S. PAT. OFF."

also afford fire protection—reduce maintenance costs and insurance rates—solve the garage ventilation problem and can be obtained in standard size—just like those installed in the six-story garage of the Herring Motor Car Co., Des Moines, Ia. (to the right)—for the same price that you are asked for good wood sash.

Build this winter—avoid the spring rush—save money.

Write for our new pamphlet
"Suppose This Were Your Garage."

DETROIT
STEEL PRODUCTS CO.
Dept. K15 Detroit, Mich.



Pyrene FIRE EXTINGUISHERS

would have saved the one hundred and fifty cars destroyed by this fire—and

15 Per Cent on the INSURANCE

Inspected, Approved and Labeled by the Underwriters' Laboratories, Inc.

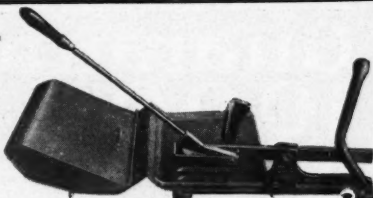
PYRENE MFG. COMPANY
52 Vanderbilt Avenue, New York City

Branches in 41 Cities

The Pyrene Co., Ltd., 19-21 Great Queen St., London, W. C.



Be Equipped to Make \$1.50 to \$2 in 15 Minutes



This Machine and One Man Can Earn for You \$5 in an Hour.

That's what people who own cars carrying old-fashioned plain hoods are willing to pay you to make hoods ventilating type. That's what you can collect in cash for 15 minutes of an employee's time, operating the MAYO Louvre Cutter, while the customer waits.

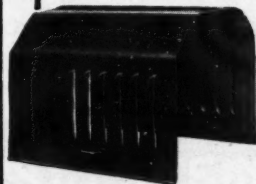
MAYO LOUVRE CUTTER

—cuts clean, ornamental vents in old style hoods, to increase motor efficiency and driving comfort. Won't mar varnish or crack metal. Brings new customers to your shop, and increases the profits of your service department. Every car with a plain hood is a prospect. Count them all—at \$1.50 to \$2 each for you.

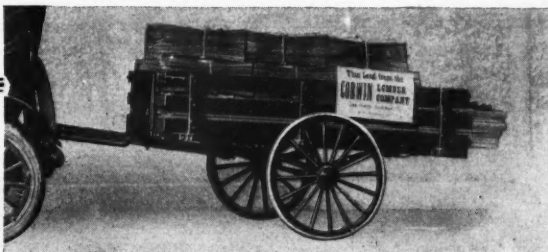
Sold on Ten Days' FREE TRIAL

—and unconditionally guaranteed to do the work. Write today for free illustrated circular, price and details.

MAYO MFG. COMPANY
54-60 E. 18th St., Chicago



Note clear-cut ornamental vent



DEALERS!

All over the country our representatives are selling JACKSON TRAILERS to farmers, wholesale and retail merchants, contractors, plumbers, fruit growers, hardware men, expressmen, painters and decorators and to men in a hundred other lines of business.

We need a number of new dealers everywhere—NOW. Immediate action is necessary. Wire or write us. Spend your spare time during the dull season making handsome trailer profits.

Figure out just how many prospects in your vicinity need and can use a trailer. Figure your profits. "The Trailer Way Makes Cars Pay."

There's a JACKSON TRAILER for Every Purpose

in a variety of styles at all prices. Send for prices and detailed information.

Don't Delay
Make Big Profits Next Month

THE MILES MANUFACTURING COMPANY
300 East Franklin Street Jackson, Michigan



The Top that gives double protection

Cover your car with Rayntite. Protect yourself, your car and your friends from drizzles or cloud-bursts. Safeguard your pocketbook from constant repair drains. Make sure of a handsome, durable, washable top unaffected by changes in temperature.

RAYNTITE

Guaranteed one year not to leak

is *sincerely guaranteed*—backed by the century-old Du Pont reputation for integrity of purpose, superiority of product and financial responsibility. It gives real service because real service is built into it. Made in both single and double texture. Any top maker can supply you. Insist upon Rayntite for new tops or tops that need re-covering.

Write for free samples and booklet

Du Pont Fabrikoid Co. Wilmington, Del.
Canadian Factory and Sales Office, Toronto



Right Now

This Fall

When Competition Is Keen

When you realize you must have **Quality** and that the price you pay must be right. This is the time when **Bulldog Quality** in Rubberized Fabrics demands your attention.

Attractive Waterproof Fabrics
in Mohairs, Serges, Etc.

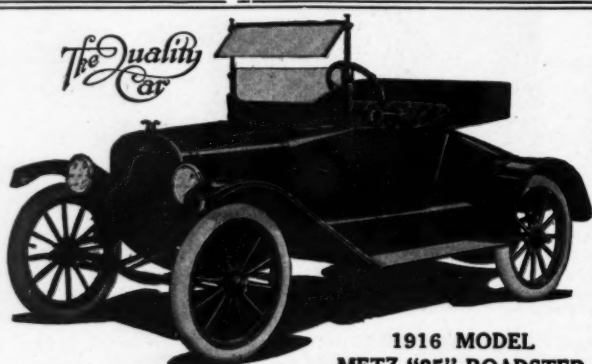
WE ARE THE SOLE MANUFACTURERS OF



For Luxurious Waterproof Upholstery

New samples now ready

L. J. MUTTY CO., Boston, Mass.



**1916 MODEL
 METZ "25" ROADSTER**

METZ

1916 models. Price, \$600 each, completely equipped. Both Roadster and Touring Car built on same chassis, 108-inch wheel base, and carry identical equipment, including electric starter and electric lights, 25 h. p. water-cooled motor, large wheels and tires, rain vision wind shield, instant one-man top, speedometer, built-in gasoline gauge, signal horn, etc. Write for DEALER particulars and new illustrated catalog "K."

METZ COMPANY, Waltham, Mass.



1916 MODEL, METZ "25" TOURING CAR

Guaranteed for 10,000 Miles



BRICTON Pneumatic Tires are guaranteed for 10,000 miles and under a specific 10,000 mile written service guarantee. What more can you ask of a tire? With Bricton Tires, punctures, blowouts and rim-cuts are eliminated—they are proof against ruts, oil and gasoline. Resilient and easy riding, too.

Try Them at Our Risk

Give Bricton Tires a free trial on your own car. Put them to test at our expense. Find out why Bricton Tires sales are increasing daily.

Your Tires Rebuilt the Bricton Way

If the fabric in the tires now on your car is in good condition, we can take them and make them proof against rim cutting, punctures, blow-outs, sidewall breaks, skidding, ruts and oil and give you thousands of miles of additional service.

Write today for full information about Bricton Tires. Tire Rebuilding and details of our liberal Free Trial Offer.

THE BRICTON MFG. CO.
 12-115 Bricton Bldg.

Brookings South Dakota

Bricton Pneumatic Tires

MOST automobile owners want their cars to look well. Few, however, realize that the beauty of many cars is impaired and even spoiled by shabby tops, whereas the cars are otherwise perfect. You can easily confirm this if you stop for a few minutes on some busy thoroughfare and take note of the cars as they whirl by.

If given the opportunity of making close examination you will discover that most of the handsome tops are covered with

Genuine

Pantasote

Top Material

Note especially the tops which have seen service. Almost any top looks well when new.

Note also the handsome appearance of the tops on such cars as Pierce Arrow, Marmon, the latest Locomobile, Cole, Hudson, etc., on which genuine Pantasote is used exclusively.

The explanation is simple. Pantasote can be easily cleaned. Dust, dirt or grease cannot become imbedded in it, and it will not fade or crack. It possesses lasting durability.

"What's What in Top Materials" explains the entire top material question. Your name and address on a postal brings this interesting and informative booklet, free.

The Pantasote Co.

1705 Bowling Green Bldg.

NEW YORK CITY

FORD OWNERS-LOOK!

*Luxurious Riding Comfort
Guaranteed*

We guarantee Big Six Shock Absorbers to increase the riding comfort of your Ford 100 per cent or money refunded.
We also guarantee that they will last as long as the car itself, and will not deteriorate or break under any circumstances fair or unfair. Furthermore, we guarantee Big Sixes to be the

Only Full Action Combined Shock Absorber and Snubber

the only device that absorbs both the small jolts and the rebounds, or up-throws. Equally efficient whether one or five passengers. Affords a luxurious riding comfort hitherto unknown to Ford cars; lengthens life of car and tires; protects regular springs. BIG SIXES are built on a different principle—ingenious leverage principle—long spring motion absorbing short body motion; long tension springs instead of short compression; uniform tension in place of diminishing; springs always under tension.

BIG SIXES are winning Ford owners from coast to coast. Price only \$15.00 per set of four attached to your car.

Write today for illustrated, descriptive folder, liberal introductory FREE TRIAL offer, and name of dealer in your locality.

**BIG
SIX**

**SHOCK
ABSORBER
& SNUBBER**

FOR FORD CARS

NOTICE TO DEALERS

The "BIG SIX" is a revolutionary invention, sold in a revolutionary way. As a result it is one of the fastest selling accessories. Dealers make a good profit, and we assist liberally with advertising literature.

In the event we have no agent in your town, we will be pleased to send you our proposition. WRITE!

Universal Trailer Co.

Dept. 8
1118-20
Michigan Blvd.
Chicago, Ill.




PEERLESS

Automobile Specialties

Make Old Cars Look Like New

Used by Over 6,000 Automobile Painters

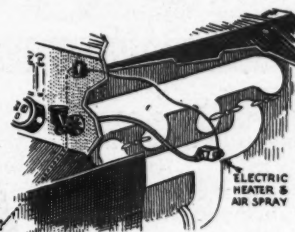
- PEERLESS Mohair Top Dressing—Waterproofs and renews old and leaking tops
- PEERLESS Leather Top Dressing—Softens and renews old leather tops
- PEERLESS Lining Dye—Makes a black, uniformly colored lining
- PEERLESS Cushion Dressing—Brightens and renews cushion leather
- PEERLESS Lamp Enamel—Gloss—A rich, gloss finish—air drying
- PEERLESS Lamp Enamel—Dull—A rich, dull finish—air drying
- PEERLESS Auto Body Polish—A renewer and polish for automobiles
- PEERLESS Cylinder Enamel—Black—A gloss, air-drying, black enamel
- PEERLESS Cylinder Enamel—Gray—A gloss, air-drying, gray enamel
- PEERLESS Extra Fine Black Japan—A heavy-bodied, rich black gloss enamel
- PEERLESS Ford Top Dressing—Especially prepared for Ford tops
- PEERLESS Anti-Rust Rim Paint—Keeps tires from sticking
- PEERLESS Extra Fine Black Japan—Solid covering enamel for all work
- PEERLESS Mirroroid—A Varnish Renewer—A varnish applied with a cloth.

1 GAL., \$3.75—1-2 GAL., \$1.98—1-4 GAL., \$1.04—1-8 GAL., 54c.

Sold Everywhere by
Jobbers, Dealers, Garages, Hardware Store
Used by Chauffeurs and Owners

**THE
Columbus Varnish Co.**
COLUMBUS, OHIO



**Indispensable
in Cold
Weather**

**Easy to
Attach**

Your Car Starts Quickly in Zero Weather if you have an Ieco Electric Manifold Plug. You don't have to waste a half hour trying to get started. You don't have to use up all your battery running the self starter. The Ieco Plug puts a hot vaporized mixture into the cylinders and the engine goes at once.

The IEICO MANIFOLD PLUG

SAVES 25% FUEL.
DETECTS CARBURETOR TROUBLES.
REMOVES CARBON DEPOSITS.
PRIMES FROM SEAT.
IS EASY TO INSTALL.

GUARANTEE—The Ieco Manifold Plug is guaranteed for two years against burn-out. If your dealer can't supply you, will send upon receipt of price. Complete with all attachments, ready to install, \$5.00 (in Canada, \$7.25). When ordering specify voltage of battery. Ford cars require six dry cells.

**INTERSTATE
ELECTRIC CO.**

848 Perdido Street
New Orleans, La.



MOLESKIN QUALITY

O'BANNON
ARTIFICIAL
LEATHERA SUPERIOR
LEATHER SUBSTITUTEO'BANNON CORPORATION
200 FIFTH AVE. NEW YORK

WINTON SIX

The closed car is distinctly the car of the successful family. No other car so fully bespeaks its owner's taste. In finishing fabrics from world-famous designers, in rich and harmonious color combinations, and in appointments, your Winton Six sedan or limousine will be a creation individually your own. Prices are unusually attractive. A card from you will bring full information.

THE WINTON COMPANY

424 Berea Road

Cleveland, Ohio, U. S. A.

BLOOD BROS.
Universal Joints

The fact that Blood Bros. Joints have been used on some cars as a regular equipment for ten years speaks well for them. There is a reason.

Ask any user or write to the manufacturers.

Blood Bros. Machine Co., Allegan, Michigan

1916

\$850



Same Car
New Price

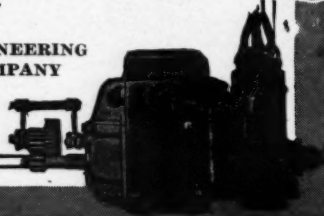
Touring &
Roadster

DELCO

ELECTRIC LIGHTING CRANKING IGNITION

The man who sells a Delco equipped car has a talking point with a wonderful appeal to it.

THE DAYTON ENGINEERING
LABORATORIES COMPANY
Dayton, Ohio



Dyneto
TRADE MARK
REGISTERED

Weight 45 lbs.

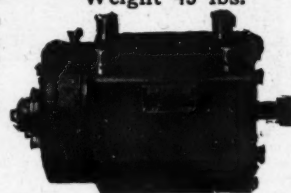
The
Single Unit
Electric Starting
and Lighting System. Lighter,
yet more powerful than most
two-unit systems.

Famous on the Franklin

Write for Catalog and Full
Particulars

DYNETO ELECTRIC CO., Syracuse, N. Y.

Send Us Your Electrical Problems



SALISBURY

AXLES WHEELS
PROPELLERS

Salisbury Wheel
& Mfg. Co.
JAMESTOWN, N.Y.

Detroit


50% Reduction in List Price
of Detroit Batteries. Detroit prices are net and mean what they say.

Detroit Batteries are proven best by the tests of engineers—first in capacity, first in capacity for weight, first in reliability. Boxes are finest woods. Cells are tested with 30,000 volts, acid thoroughly tested, and water distilled in our own plant to insure purity.

There's a Detroit Battery to Fit Every Starter and Every Car.

Write for dealers' proposition.

DETROIT BATTERY COMPANY
DETROIT, MICHIGAN



EISEMANN

The most simple—the most accessible—the most durable—the most efficient magneto ever produced is the new Type G-4.

The Eisemann Magneto Company
Sales and General Offices,
32-33d St., Brooklyn, N. Y.
New York, N. Y. Indianapolis Ind. Detroit, Mich.
245 W. 35th St. 415-417 N. Capitol Ave. 302 Woodward Ave.



MOSLER

VESUVIUS **SPARK PLUGS** **SUPERIOR**

POWERFUL INDESTRUCTIBLE SURE

\$1.00 75c

*Fits Any Motor
Special for Fords*

JOBBER AND DEALERS

Write for our new price schedules and samples of Sales Promotion literature.

A. R. MOSLER & CO.
NEW YORK, N. Y.




Eliminate Wear and Repair, by Using

NON-FLUID OIL

Only perfect lubricating stops frictional wear on gears and bearings. Only perfect lubrication can obviate costly repair bills. No lubricant of any kind that has ever been produced does as much work in reducing friction and eliminating costly repairs as NON-FLUID OIL does. Broad claim this, but a trial will prove it. It is the only lubricant that insures efficient service until the old age of your car.

Get a Can Today and Prove It

"K No. 00 Special" grade for sliding gear transmission. "K No. 000" for differential compression cups and all bearings.

Reduced Prices—Ask Your Dealer. Avoid Substitutes.

New York & New Jersey Lubricant Co.
165 Broadway, New York

SAVIDGE STEERING DEVICE

Built especially for FORD cars

Makes driving easy, positive, dependable and safe. Will keep the front wheels from "buckling under" when turning.

Sells on its merits

\$4.90 Satisfaction Guaranteed

Savidge Steering Device Co.
502 Murphy Bldg., Indianapolis, Ind.



Ford
THE UNIVERSAL CAR

What the Ford car will do is amply proven by its daily use in the hands of more than 1,000,000 owners. It saves money in operation and maintenance.

Runabout \$390; Touring Car \$440; Town Car \$640.
f. o. b. Detroit

Ford Motor Company
Detroit, Michigan

GENEMOTOR

For Starting and Lighting FORD Cars

Built By The

GENERAL ELECTRIC COMPANY

A. J. PICARD & CO.

1720-22 Broadway Sole Agents NEW YORK


Lack of Knowledge Is Expensive

Why not secure a copy of The Automobile Catechism which contains a complete course in automobile instruction with each subject discussed and illustrated so that you will grasp every point worth while—every subject is made as simple as A. B. C. The regular price of this book is \$2.50 but to make our offer irresistible we will—for a limited time only—offer it at \$1.25.

THE CLASS JOURNAL COMPANY
910 S. Michigan Ave. Chicago, Ill.

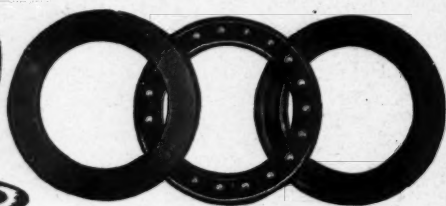
This book at \$1.25

will prove the best investment you ever made. Send for a copy now rather than regret later your failure to act promptly.



The Bearings Company of America

Sales Department, 250 W. 54th St., New York



COMPLETE THRUST BEARING

Manufacturers of Star Radial Ball Retainers, Star Ball Thrust Retainers, Star Complete Ball Thrust Bearings

Red Head
For Ford, Buick and other cars not equipped with priming cocks.
Has a big straight-sided porcelain, guaranteed not to crack from the heat of the motor and almost indestructible; long body shell, big priming cup, heavy meter wire firing points—will not burn away, oil drip bend.

\$1.25 All Sizes

Priming Plugs

Are Now the Best Sellers

One Copper Gasoline Priming Can FREE to every purchaser of a set of four plugs.

Emil Grossman Mfg. Co., Inc.

Bush Terminal, Model Factory No. 20, Brooklyn (New York City)
1253 Michigan Ave., Chicago.



MIDGLEY PATENTED Wire Tread TIRES

Plain and Non-Skid Inner Tubes

Unexcelled—Write for Complete Information

The Midgley Tire & Rubber Co.
Dept. 11, Lancaster, Ohio

701

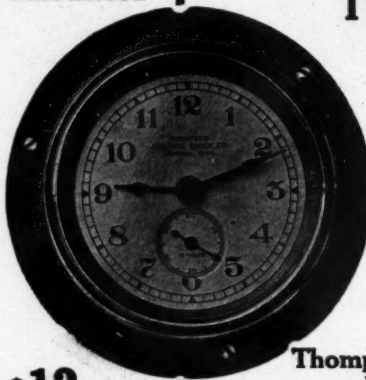
Guaranteed

The Thompson

ELECTRIC

Self-Winding

Automobile Clock



The latest step forward in auto accessories. Just as convenient as the starter and lights. It never runs down and operates from the storage battery or dry cells. Write today for free illustrated folder.

Dealers Wanted

Thompson Electric Clock Co.
Memphis, Tennessee

\$12

THE POWERFUL, SILENT SPHINX

Model B-16 \$640

A REAL AUTOMOBILE

The lightest, strongest, most serviceable and economical machine of its kind ever built.

112 inch wheel base. Electrically started and lighted.

Sphinx Motor Car Company, York, Pa.

BRAENDER

NEW BULL DOG
NON-SKID TIRE

This Tread is made under hydraulic pressure, not cut out, but pressed together into a homogeneous mass, resulting in a tougher tread.

Braender Non-Skids are as different from others as a dropped forging is from a casting.

Braender Rubber & Tire Co.

Main Office and Factory, Rutherford, N. J.

New York, 250 West 54th Street

Agents in principal cities



Steel Protectors

Each section 2" wide 1/8" thick.

They hook to rim. As flexible as ever. Anti-skid, can't blow out or rim cut.

HOW CAN THE RUBBER WEAR OFF IF IT IS COVERED WITH STEEL?

Try 2 or 3 sections over any old blowout

Special prices to the first in new territory

Kimball Tire Case Co. 173 Council Bluffs, Ia.

Tire covered complete



JUMBO SPARK PLUGS

Jumbo Giant \$1.25

Jumbo Regular \$1.00

Jumbo Junior \$0.75

Jumbo Special for Fords \$0.75

Gibson-Hollister Mfg. Co.
3380 WASHINGTON ST. 69-7 BOSTON, MASS.



SAMPSON
FEATHEREDGE
INNERTUBE PLUG

Repairs forever any puncture or small blowout in 1½ minutes. No vulcanizing—no cement—no patches. Sampson Plugs are guaranteed never to leak or injure tube or shoe. Money back if you want it, at any time. Sampson Plugs come in three outfits: No. 1—Tool and 6 Plugs in carton, \$1.50. No. 2—Tool and 12 assorted plugs in black enamel box, \$2.50. No. 3—Motorcycle kit; tool and 6 small plugs in stout wallet, \$1.50.

Stevens & Co., 376 Broadway, N. Y.

STANDARD

for FORDS



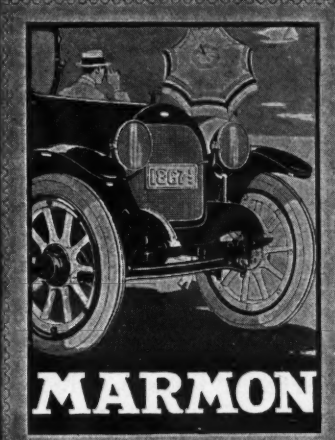
Not built down to a price, but up to the Ford standard. No matter how much you pay, you can't get more speedometer worth than we offer in the Standard.

Country-wide service guaranteed. 150,000 now in use.

\$12

Write our nearest branch, or ourselves, for discounts that mean profit for you.

Standard Thermometer Co.
65 Shirley Street, Boston, Mass.




MARMON

Worley & Marmon Co.
Indianapolis, Ind.

Provided with or without padlock.

Oakes Kranklock



Oakes Kranklock combination starting crank holder and lock and license holder. Make your car thief-proof with this handy and serviceable combination. It holds the starting crank rigid and license tag securely.

Every Ford owner needs one. Can be put on easily in a few minutes. No holes to drill. Prevents garage employees from using or tampering with your car while in garage.

Without Padlock
50c
\$1.00 with Special Yale Padlock

Made by the makers of the famous Oakes

Fan-Horn-Pump	\$12.50
Fan-Pump	7.50
Fan-Horn	5.00

Any Oakes accessory shipped direct on receipt of price.

Write for complete description of our entire line.
THE OAKES COMPANY, INDIANAPOLIS, IND.

The Niagara Motor Car \$740

36 H. P., 5 Pass., Wgt. 1970 lbs.

The Niagara Motor Car meets an exacting ideal. Full-sized and generous in all proportions. Beautiful to the eye. Stylish, dignified, snappy, attractive and superbly finished.

Exceptional opportunity for dealers. Unusual dealer assistance. Write or wire for "Dealer Helps" talk, and full information about our liberal selling plan.

MUTUAL MOTOR CAR COMPANY

Makers of Niagara Motor Cars

917-927 Main Street

Buffalo, N. Y.

THE RUTENBER MOTOR

Used in America's Best Light Weight Cars

Model 22, 3x5, 6 Cyl.



— c o m —
bines the advantages of economy in first cost and up-keep, with quality construction and efficiency. The motor that never fails.

The Rutenber Motor Co.
Marion, Ind.
Chicago Office
10 S. La Salle Street

REPUBLIC TIRES

PLAIN, "WM" AND STAGGARD TREADS

TRADE MARK REGISTERED
U. S. PATENT OFFICE

BOSCH MAGNETO

Made a clean sweep in every race of consequence held in 1915—24 races—24 Bosch victories—no other ignition ever did anything like it. Don't experiment, specify Bosch.

Bosch Magneto Co. 214 W. 46th St., New York.

Moline-Knight "40"

F. O. B. **\$1375** Factory

40 horsepower, 5 passenger touring and 2 passenger roadster, 118-inch wheel base, 34x4-inch tires (non-skid rear), spiral bevel gear rear axle, weighs 2,896 pounds ready for the road, Auto-Light starter, high tension ignition, complete equipment, 50 horsepower touring, roadster, sedan, limousine models—\$2,500 to \$3,800.

Moline Automobile Co., East Moline, Ill.

SPARTON

Safety Signals

Have the far-reaching call for country roads—the quick, snappy shriek for city traffic. Use the Sparton on your car.

Model
"F" \$4.00

Finish in satin black and nickel or all black.

The Sparks-Withington Co.
Jackson Michigan



DOUBLE SEAL TIRE VALVE

No tool needed to seat or remove Valve

Interchangeable with All Stems

Fifty Cents Per Dozen
Single Valves, Five Cents

Double Seal Tire Valve Company
1790 Broadway New York City



Actual Size

HEINZE

High Tension Magneto

Better Material
Better Workmanship

Better Manufacturing facilities

Make Heinze the Better Magneto

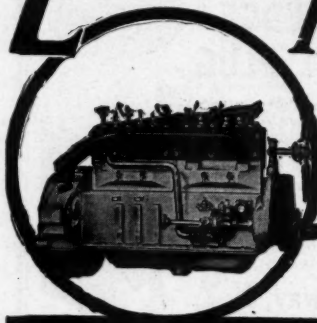
FACTORIES
Lowell, Mass.
BRANCH OFFICES
Minneapolis
Chicago
New York

SALES OFFICES
Detroit, Mich.

NEW ENGLAND DISTRIBUTOR
A. P. Homer
Boston

HEINZE ELECTRIC COMPANY

Continental Motors



Models—FOURS
Model U, 2 3/4 x 4 Model C, 4 1/4 x 5 1/4
Model N, 3 1/2 x 5 Model E, 4 1/2 x 5 1/4
Model N, 3 3/4 x 5 Model T, 5 x 5 1/2
Model C, 3 3/4 x 5 1/4 Model T, 5 1/4 x 5 1/2
Models—SIXES
Model 7 W.....3 1/4 x 4 1/4
Model 7 N.....3 1/2 x 5 1/4
Model 6 P.....3 3/4 x 5 1/4

CONTINENTAL
MOTOR MFG. COMPANY
DETROIT, MICH.
Factory Representative, K. F. Peterson,
122 S. Michigan Ave., Chicago.

Electric Auto-Lite Starting—Lighting—Ignition

Electric Auto-Lite equipment for automobiles is as famous for the service that backs it as for the reliability and economy of its operation.

ELECTRIC AUTO-LITE COMPANY

Home Office and Factory: Toledo, Ohio

New York Detroit Kansas City San Francisco

Stores, Measures and Pumps Your Grease

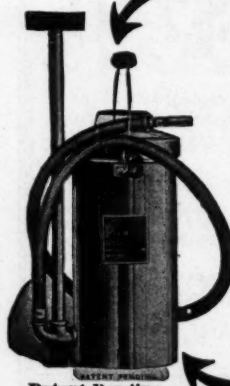
Keep your transmission greases in a clean place, and deliver them to the parts of your car as needed, simply operate the pump.

Runyen's Grease Cabinet—\$7

—is a convenient container and pump. Operates six times as fast as you can work by hand. Eliminates waste. Made in four sizes. Write for free circular.

Dealers—Big sales. Liberal discounts. No. 75—75 lbs. capacity. Saves money in garages and factories. Write for yours today. Size No. 2, Capacity, 15 lbs. List, \$7.00.

RUNYEN MFG. COMPANY
Grand Rapids, Mich.



Patent Pending

KINGSTON IGNITION DEVICES

High and low tension magnetos, make-and-break coils, dash coils, box coils, motorcycle coils, switches, spark plugs and other ignition specialties. Guaranteed satisfaction

WRITE FOR CATALOG

KOKOMO ELECTRIC COMPANY, Kokomo, Ind.

Don't Start Out Unless You Have a

Shanhouse
MOTOR SUIT

in your tool box. A handy garment for many occasions. It is a one-piece suit made of a high grade olive khaki, easy to slip on and off, covers you from head to foot and protects your clothes. The original Motorsuit bears the Shanhouse label and our guarantee. Take no other.

If your dealer doesn't carry it, send \$2.00 for one prepaid. Give chest measurement and leg length. Money back if not entirely satisfactory.

THE SHANHOUSE COMPANY, Rockford, Ill.



Wind-Shield
Spot
Lamp

\$5.00
at Retail

with nitrogen bulb.

We make Lamps, Tool
and Battery Boxes for Au-
tomobiles.

Get our new
CATALOGUE

THE VICTOR AUTO
PARTS CO.
Cincinnati Ohio

ASTOR CUP RACE

Of the 8 prize winning cars at Sheepshead Bay Speedway 5 were equipped with

RAJAH SPARK PLUGS

"Ignition Absolutely Sure"

RAJAH AUTO-SUPPLY CO., BLOOMFIELD, N. J.
JOHN MILLEN & SON, Ltd., Montreal, Toronto, Winnipeg, Vancouver

Own the vulcanizer you're paying for

Yes, paying for it in repair bills and tire service that you don't get. You buy two tires where one would do as well.

SHALER
Vulcanizer

Mends tubes and casings perfectly. You or your chauffeur can use it. Price \$3 and up. One free copy of "Care and Repair of Tires" if you write at once. Tells what you need to know about tire-saving devices.



C. A. SHALER CO., 244 Fourth St., WAUPUN, WIS.

ALWAYS ON THE JOB

Standard Chain and Chainless Trucks

Meet Every Demand

DEALERS should carefully consider the rapidly growing demand for standardized heavy duty, double duty 4-cylinder trucks. The standardized "STANDARD" meets this demand in every way.

Send for booklet B 30, describing all capacities.

STANDARD MOTOR TRUCK CO., Detroit, Mich.



Get This Catalog

It contains descriptions of all the famous Campbell Guaranteed Motor Car Accessories; Detachable Upholstery, Percama Straps, Boots, Accessories for Fords, etc.

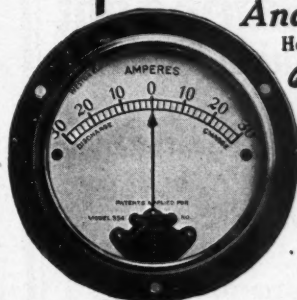
Territory open for reliable established dealers

THE PERKINS-CAMPBELL COMPANY

624 Broadway, Cincinnati, O.
New York Office, 89 Chambers Street

What About Lights And Starting Motor?

How do you know when they will fail you?



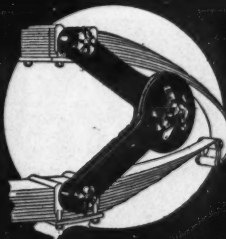
Weston

Model 354 AMMETER
On Your Dashboard or Cowl

furnishes you a reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge.

Weston Electrical Instrument Co., 10 Weston Ave., Newark, N. J.
Branches in the Larger Cities

The **Hartford**
SHOCK ABSORBER
Makes ROADS LIKE THIS
FEEL LIKE THIS



Stops jolting, jarring and vibration. Eliminates side sway. Contributes to solid auto comfort. Prevents spring breakage. Makes tires last longer. Cuts cost of maintenance. Insures longer life for your car. Complete literature on request. Write mentioning make, model and year of car and we will advise how to equip to secure genuine comfort. Your new car will be Hartford-equipped if you insist.

HARTFORD SUSPENSION CO.

E. V. Hartford, Pres. 146 Morgan St., Jersey City, N. J.
*Formerly Truffault-Hartford Shock Absorber.



How Many?

When dealers see

Parker-Hydraulic Pressed Steel Wheels

it is usually a case of how many. They know they'll sell because these wheels are lighter, stronger and the rims are more easily demounted than from wooden wheels with demountable rims.

Our proposition to dealers is attractive. Write for it today.



The Hydraulic Pressed Steel Co.
3170 East 61st St. Cleveland, U. S. A.

The Correct Upholstery for Touring Cars is



MOLEX

a woven textile designed and constructed to meet all the requirements and abuses of touring car and convertible body upholstery. "MOLEX" should not be confused with ordinary cloth upholstery, such as is used in limousines, electric cars or horse drawn vehicles.

We have prepared an instructive and interesting booklet describing in detail the features and ad-

The Laidlaw Company Inc.
New York City

vantages of "MOLEX" Upholstery for touring bodies. We will send this booklet if you request it.

Series
22-72



Four
Cylinder
Only

Ready for Delivery Early in November

DETAILS ON REQUEST

MERCER AUTOMOBILE COMPANY
800 Whitehead Road, Trenton, N. J.

Add to Garage Profits by Oxy - Acetylene Welding

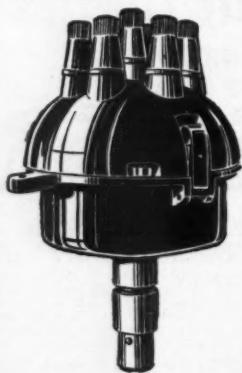
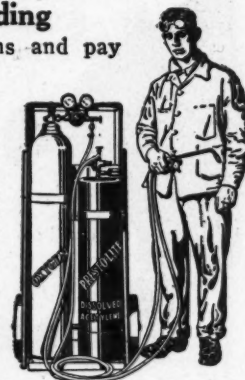
Savings made please your patrons and pay good substantial profits.

PREST-O-LITE

Dissolved Acetylene
(Ready-made carbide gas)

adds to the efficiency and usefulness of any good welding equipment. We furnish thoroughly high grade welding apparatus for \$80.00. The average user will also need gas cylinders at an additional cost, and about \$10.00 worth of welding supplies. Truck and special equipment for cutting operations at extra cost. Send for details of Prest-O-Lite Service for Oxy-Acetylene Welding.

The Prest-O-Lite Co., Inc.
The World's Largest Makers of
Dissolved Acetylene
233 Speedway Indianapolis, Ind.



The Atwater Kent Ignition System

Used by one-quarter of all
1915 U. S. A. built cars,
exclusive of Fords.

4934 STENTON AVENUE
PHILADELPHIA, PA.

National SPECIAL RED TUBE

DEALERS: Write for details of exclusive territorial proposition, terms, discounts, etc., on National Tires, Tubes and Rubber Accessories.

National Rubber Co.
Pottstown, Pa.



HYATT QUIET ROLLER BEARINGS



Service Branches:

Atlanta Detroit
Boston
Chicago Los Angeles
New York
Minneapolis San Francisco
London, Eng.

Corcoran Lamps

GAS, OIL, AND ELECTRIC

CORCORAN LAMP CO.
CINCINNATI, O.

—even this old boy
is hitting on all cylinders

BUT—Hes Wasting Fuel

Don't think because your engine is hitting on all cylinders you're getting maximum service!

Write us for astonishing carburetor revelations—new facts you've probably never heard of—learn how the New Stromberg Carburetor will increase the power, speed, acceleration and gas economy of your car whether it is new or old. Be sure to state name, model and year of your car.



New **STROMBERG** Does it!
CARBURETOR

When Purchasing a Car
Insist Upon a

—LEECE—
ELECTRIC
STARTING-LIGHTING
SYSTEM
NEVILLE

100%
efficient

100%
efficient

THE LEECE-NEVILLE COMPANY
(58) CLEVELAND, O.

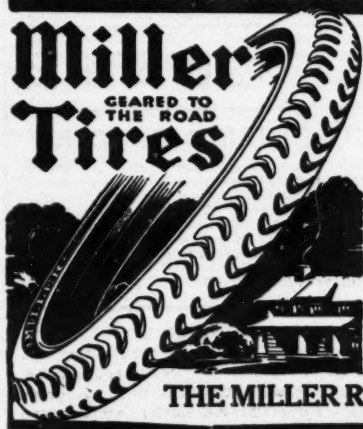
VIKING
SPARK PLUGS

A greater sum of the essentials to unfailing service and complete satisfaction will be found in VIKING design and construction, than in any other plug at any price.

Buy **VIKING PLUGS** as
an insurance of service

Price \$1.00 each—all styles

THE JOHN MAC GREGOR COMPANY, INC.
ROSLINDALE BOSTON, MASS.



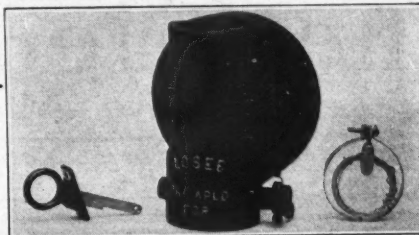
Join the
Miller Prosperity
Procession

Be the exclusive
Tire Dealer in
your town—the
Miller Dealer.

Write for the Miller
Plan—it doesn't pit one
dealer against another.

THE MILLER RUBBER CO., Akron, O.

CHALMERS DEALERS AND OWNERS



"THE LOSEE CUTOUT"

Made especially for Chalmers, 6-40, Overhead Camshaft Motor. This is a cutout and muffler head combined, and is the only cutout on the market that is applicable to this model car.

Mfg. by J. S. LOSEE, Hebron, Illinois

CARSRING TIRES

BEST UNDER A CAR BEST ON EARTH

Will establish you in business on a permanent and profitable basis.

Our Policy:

One good dealer in each territory, backed by the best goods and unlimited co-operation.

New Jersey Car Spring
& Rubber Company
Jersey City, New Jersey



Carspring Tires are permanently non-skid

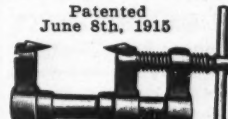
Knowlson's Spring Spreader

Drop Forged

Patented
June 8th, 1915

100% Easier
Riding

Nickel Plated
and Polished



Pat. No. 1142280

Stops the Squeak

WARNING To The Trade

Our Patent is basic in principle, covering all spring spreaders with wedges on the market no matter how operated. Our rights will be protected.

At all best Dealers, or sent prepaid anywhere for \$1.50.

Money returned if not satisfactory.

Write for complete particulars.

Spring Leaf Lubricator Co.,

1004 Forest Ave.,
Ann Arbor, Mich.

Women Say---

THE ELECTRIC GEAR SHIFT
makes a big gasoline car as easy to
drive as an electric.

The C-H Magnetic Gear Shift

is being supplied as special equipment by

THE WINTON MOTOR CAR CO.

Cleveland, Ohio

THE L. P. C. MOTOR CO.

Racine, Wisconsin

THE THOS. B. JEFFERY CO.

Kenosha, Wisconsin

THE PULLMAN MOTOR CAR CO.

York, Pennsylvania

Write for booklet "Gear Shifting by Electricity"

The CUTLER HAMMER MFG. CO., Milwaukee, Wis.

The Clearing House of the Motor Car Industry

*For Used Cars, Parts, Accessories, Tires, Welding, Repairing Machinery
and all other Special Announcements of a Similar Character*

ADVERTISING RATES Minimum space, 1/4 inch—One time, \$2.40. Three times, \$5.85. 1 inch—One time, \$4.50. Three times, \$10.80.
1 1/4 inches—One time, \$6.75. 2 inches—One time, \$8.75. Rates for other spaces and longer terms on request.

CARS—FOR SALE AND WANTED

FOR SALE

One 48 H.P. Pierce Arrow, five passenger, late 1915 Touring Car. Absolutely brand new condition—paint and mechanical. Seat Covers. Price \$4000. Run 2400 miles.

J. L. NUGENT
2646 Locust St., St. Louis, Mo.

GET OUR LATEST BULLETIN OF USED CARS
You can get from us good, serviceable machines of various makes for \$400 and up.

PACKARD MOTOR CO. OF CHICAGO
2367 Michigan Ave., Chicago, Ill.

Matheson

Cars and Repair Parts

FRANK F. MATHESON, Wilkes-Barre, Pa.

Motor Buses For Sale

(Used 3,000 Miles)

27-PASSENGERS

Unique body and seating features. Continental Motors.

PRICES 50% BELOW MARKET
Address Box E 439, Motor Age, Chicago

Two and Three-ton Trucks, Packers' Bodies, cab over the driver's seat, rebuilt and in excellent condition. These are bargains.
CONDON 2635 Wabash Ave., Chicago

40 H. P. WHITE STEAMER
MODEL O WHITE STEAMER
WHITE STEAMER PARTS AND REPAIRS
R. A. ROBBEL
3025 Indiana Ave., Chicago

GARAGES, SHOPS, ETC. FOR SALE—WANTED

FOR SALE

New, modern, fully equipped 90x50, two-story garage; centrally located; town of 65,000; good business; full line of accessories.
Address Box E426, care Motor Age, Chicago

HELP & SITUATIONS WANTED

EXECUTIVE SALES ENGINEER

Broad experience, continues successful sales record with manufacturer of electrical apparatus; has executive ability, thorough knowledge of modern business methods and factory practice; is desirous of becoming associated with manufacture of automobiles or allied lines in an executive sales capacity or special sales representative. Address Box E 437, c/o Motor Age.

DISTRICT MANAGER

A Chicago Engineering and Realty Corporation has a permanent position with a good future to offer as Manager of Minneapolis Office. A successful business man with executive ability and engineering knowledge and who is in a position to take a financial interest of not less than \$2,500 are the requirements. Investment fully secured. To such party we give guaranteed contract with salary, commission, expenses and profit sharing interest. Give full statement in first letter. Address

Box E 440, c/o Motor Age, Chicago

SITUATION WANTED—AUTO ACCOUNTANT
Can take full charge of office detail, install system, render monthly statement, curb losses. Able correspondent. Years experience with largest Auto Mfg. in U. S. Address

Box E 441, care Motor Age

MACHINERY

SECOND-HAND MOTORS

We have the largest stock of second-hand electric motors and generators in America and buy and sell, rent, exchange and repair electrical machinery of all kinds. Send for our "Monthly Bargain Sheet," showing complete stock with net prices. All machinery guaranteed in good order.

GREGORY ELECTRIC CO.
Cor. 16th and Lincoln Sts. Chicago

MAGNETOS—SERVICE STATIONS

A Big Demand for Bosch, Elsemann and Mea magnetos. We pay cash for them. Send full description.

EMEIS MANUFACTURING CO.
Magneto Experts
217-22 Iowa St. Davenport, Iowa

Always before you spend money on Ignition or Lighting Repairing, "Try Us and Be Convinced." Expert repairing, Magnetos, Coils, Generators, Starting Motors, Ammeters, Armatures and Fields rewound. **CHICAGO MAGNETO EXCHANGE**, 2333 Mich. Ave., Chicago. Cal. 3954.

ALL TYPES IGNITION
Repaired by Expert Mechanics
The New Service Station for
Platinum Points and Vibrator Springs
Write for Catalog
THE MOTOR CAR SERVICE CO.
4660 Lake Park Ave. Chicago

GRAY & DAVIS

Starting-Lighting Systems, \$115.00

Can be installed on most any car and any mechanic can make the installation. Write for catalogue.

PELLET'S MAGNETO EXCHANGE
1606 Michigan Ave. Chicago, Ill.

MAGNETO EXCHANGE

We Buy, Sell, Trade, Repair all types of MAGNETOS AND IGNITION devices

Trained Experts in Every Department

Master Sales Company, Inc.

2416-18-20 Farnam St. Omaha, Neb.

MAGNETOS—Sold, Exchanged, Repaired
Dealers and repairers of generators, starting motors, magnetos and coils. Several Bosch, Remy and Splittdorf magnetos at bargain prices.

H. B. WEBER & CO.
1338 Michigan Ave. Chicago

Our Service Saves Your Electrical Equipment

It has taken years of study and experience with every electrical appliance for the automobile to establish for you our thoroughly efficient service station.

Today, our battery department is equipped with every device known for prompt repairs, and is in charge of experienced workmen.

Our starting and magneto department gives you the benefit of the same high-grade service of other trained specialists.

Every job is thoroughly tested before delivery.

Official repair shop for
Willard Storage Batteries
Northeast Starters
Gray & Davis Starters
K. W. Magnetos

—but we repair anything electrical if it can be repaired.

The E. S. Cowie Electric Co.

Kansas City, Missouri

MAILING LISTS

MAILING LISTS AND STATISTICS. Owners or dealers; any state, county, city; weekly and monthly supplements at lowest prices. Special lists of electrics, trucks, Fords, Studebaker, Overland, etc. **MOTOR LIST CO. OF AMERICA**, 1107 Locust St., Des Moines, Iowa.

MANUFACTURER'S OPPORTUNITIES

MANUFACTURING CONCERN

Making and marketing automobile accessory with national reputation desires to add two or three other meritorious accessories to its line. Have unlimited capital and necessary sales facilities to make and market. Full information as to nature of article together with estimate as to cost of producing and probable selling price must accompany reply.
Address Box E 488, c/o Motor Age.

WANTED—AGENCY

of Automobiles and Motor Plows for Switzerland and Southern Germany by well established, responsible, first-class automobile firm. Address M.R.1249, care Rudolf Mosse, Zurich, Switzerland

The Clearing House—continued.

MISCELLANEOUS

SALESMAN AND BROKER

With New York and Chicago Office, Would like to connect with a reliable party who can build a small runabout at less price than any on market. You make them; I sell them. We will divide the profits. State full particulars in first letter.

DAN I. MURRAY

3 Maiden Lane, New York
440 South Dearborn St., Room 460, Chicago, Ill.

SAMUEL L. WINTERITZ & CO.

AUCTIONEERS

504 Rector Building Chicago, Ill.

MOTORIST'S BOOKS

DELCO Electric Systems
Information Book No. 2 1910-1915 INC.
Complete instructions on wiring, care of parts, operation, etc., for owners, garage men and mechanics. Postpaid for 40 cents.
AUTO ELECTRIC SYSTEMS PUBLISHING CO.
400 U. B. Bldg., Dayton, Ohio

Gas, Oil and Steam Engine Hand Book
370 pages, illustrated, cloth, \$1.00. Send for complete list.

CHARLES C. THOMPSON CO.
501-509 Plymouth Court Chicago

HUNDREDS OF TROUBLES AND REMEDIES
for car owners, auto schools, garage, repair and salesmen. Prepares you to pass Civil Service Examination. Satisfaction or money refunded. Postpaid for 30 cents.

WM. B. WIEDHOFFT
2334 Larrabee St. Chicago, Ill.

"THE MODERN MOTOR CAR"

Just off the press—512 pages covering all phases of the Motor Car, 170 pages on Electric Starting and Lighting. Send for sample pages.
LAIRD & LEE, Inc.
1742 Michigan Ave., Chicago, Ill.

MOTORIST'S CLOTHING

FUR LINED OVERCOATS

Manufacturers' samples. Black broadcloth outside, lined throughout with Mink dyed marmot, a beautiful Fur like mink. Large Persian Lamb collar; full length; all sizes; making a handsome coat suitable for dress wear or driving.

\$29.50

Would retail for \$60.

SENT FOR EXAMINATION

You take no risk. Examine before paying. Write today, stating size. Enclose 50c for express charges only and coat will be sent at once.
E. HART, Dept. F, 518 W. 134th St., N. Y.

PARTS AND REPAIRS

ALL REPAIR PARTS

Supplied promptly, any "orphan" car. Send us broken parts for quick duplication; service the best and prices right.

AUTO PARTS CO.
1404 Henn. Ave. Minneapolis, Minn.

ALL SEASON'S RECORDS MADE WITH
Schebler equipment. Why not get a Schebler Model R for your car? Our exchange proposition makes it easy.

J. C. NICHOLS, Direct Factory Distributor
1673 Broadway New York

AMERICAN UNDERSLUNG

Parts and repairs for all models
PARTS CATALOG FREE
Write for prices and discounts
V. A. LONGAKER COMPANY
Indianapolis, Ind.

American Underslung and Marion

Motor Car Parts and Service
CHARLES E. RIESS & CO., Inc.
1690 Broadway, New York

All Service Parts for All Cars

This is a rather broad assertion, but we can back it up by facts. We have acquired through outright purchase the stock of some 67 defunct automobile companies that have ceased manufacturing. We are acquiring others constantly. This huge organization enables us to quote prices on automobile repair parts far below those of manufacturer.

Look This List Over

Michigan, Krit,
Speedwell, Abbott

Warren, Marquette, Ranier, Deluxe, F. A. L. Car, Reliable Dayton, Anhut, Elmore, Welch Pontiac, Welch Detroit, Demot, Barnes, Cutting, Grabowsky, Wayne, Northern, Ohio, Crescent, Havers, Owen and lots of other makes. If your car is not listed, write us, stating model, and we'll quote you price at once.

Write Today

We've Got the Habit

We just keep on buying them all up—Makes 67 automobile companies bought by us to date—You profit, as our huge purchasing power enables us to quote the world's lowest prices on everything for the automobile.

Fenders to fit Hupp, Crescent, Ohio, Everett cars, per set \$12.00. Fenders to fit your car at the same price. Write us now. Bodies to fit Ford pick up \$10.00. Garages—Portable, wood, \$40.00 up; steel, \$59.25. Wire wheels for Fords (short time only), complete with hubs and bearings, per set \$12.00 (allowance of \$2.00 per set for old wheels returned to us charges prepaid). Radiators for Ford's, honeycomb type V shaped, \$17.00 up. Weston-Mott semi-floating front and rear axles, complete with wheel parts, per pair \$75.00. Vises, machinists and pipe, per inch \$0.85. Brand new mohair tops, 1915, five-pass, complete with curtains and dust boot \$22.50. Tops for most all other makes at big bargains. Perkins four cycle, water cooled motors, bore 2 1/4 in., stroke 4 in., shipping weight 170 lbs. Bucket seats, per pair \$18.00; auxiliary seats, per pair \$10.00. Gray slip roof outfits for Fords—consists of heavy rubber roof, quarters, back curtains and stays—makes like new, \$7.50. Springs all sizes, \$2.00 up. Famous Deaco starting and lighting outfits for Fords, formerly \$200, now \$55. World's largest stock of transmissions, motors, front and rear axles, tops, bodies, and everything for the motor car. Special mail order department for the Motorist.

Write for Bargain Bulletin

PURITAN MACHINE CO.

410 Lafayette Boulevard, Detroit, U. S. A.

ALL PARTS FOR ALL CARS

A PLACE TO BUY AND SAVE MONEY

New Departure bearings, Hyatt roller bearings and Timken bearings.

Piston rings for nearly all motors, set 12. \$ 3.00
Anti-leak 2-piece rings, 3/4" to 5", each... 1.00
Nickel steel driving gears for Ford, set... 6.50
Racing gears, 3:1 ratio, Ford... 10.00
New full floating axles for 4,000-lb. car... 90.00
34x4 wheels, Q. D. rims, 12, 1 1/4" spokes, set 12.00
34x4 demountable wheels, straight side rims, set 4... 22.00
13 H. P. air cooled V motor, complete... 62.50
Brown-Lipe transmission with levers... 50.00
5-pass. bodies not upholstered, 92" long... 15.00
10" fenders for touring cars, set 4... 10.00
Henderson model 46 radiators... 21.00
Mitchell model F radiators... 25.00
Marion 6-cyl. honeycomb radiator... 35.00
Racing seats, 16" wide, 21" long... 18.00
We make radiators and springs for all cars.

Repairs for Croxton, Carnation, Michigan. Springs and Radiators for all cars.

Try Us for Service

K. C. AUTO PARTS CO.

1827 McGee St. Kansas City, Missouri

All Types of Bearings

The New Departure Service Station
THE GWILLIAM COMPANY

Engineers

Specialists in Bearings

New York—253 West 58th St. (at Broadway)
Philadelphia—1314 Arch St.

AMERICAN UNDERSLUNG

We are the sole owners, manufacturers and distributors of repair parts for ALL MODELS AMERICAN UNDERSLUNG CARS.

AMERICAN MOTOR PARTS CO.
831-33-35-37 E. Washington St.
INDIANAPOLIS, IND.

Auto Firms and Manufacturers, Attention!

We are now opening our new plant containing 45,000 square feet floor space and equipping it with all manner of regular and special machinery. We are in a position to take over large and small contracts in the manufacture of auto parts, special machinery work and general contract orders. Brass and malleable iron foundry, plating, oxidizing and enameling; special machinery will be installed to accommodate customer.

THE LOHSE AUTOMOBILE IMPROVEMENT COMPANY
W. 70th St. and Big Four R. R., Cleveland, Ohio

Automobile Motors

RAMBLER 35 H.P. (overhead valves)... \$ 75.00
KRIT unit power plant 4 cyl. 22 H.P. with pedals and levers... 125.00
THOMAS 4-cyl. 60 H.P. fitted with Bosch magneto and Stromberg carburetor... 150.00
VAN 22 4-cyl. 20-22 H.P. (overhead valves) ... 75.00
OHIO 35 H.P., 4x5" ... 100.00
MITCHELL 4-cyl. T head, 4 1/4 x 5", 30 H.P. ... 100.00
CADILLAC 4-cyl., 4 1/4 x 5 1/4", 40 H.P. ... 75.00
FALCON 6-cyl. 60 H.P. ... 250.00
THOMAS 6-cyl. 90 H.P., 5 1/2 x 5 1/4", fully equipped ... 250.00
WISCONSIN 6-cyl. 50 H.P., fully equipped ... 250.00
CHASE, 3-cyl. air cooled ... 50.00
DE LUXE 2-cyl. V shape cyclecar motor, 9-13 H.P., fitted with fan, crank, Atwater-Kent ignition system, Schebler carburetor ... 40.00

Our stock of motors is the most complete in the U. S. Send your specifications. This is only a partial list.

AUTO PARTS COMPANY

Dept. M1

740 W. Jackson Blvd. Chicago, Ill.

See Our Ads on Other Pages. Get Our Bulletin of Bargains.

The Clearing House—continued.

AUTOMOBILE PARTS

MICHIGAN, MORA AND DRAGON PARTS IN STOCK

We maintain a complete stock of parts for the above cars.

PHILADELPHIA MACHINE WKS.
67 Laurel Street, Philadelphia, Pa.

AUTOMOBILE TOPS

Built, Recovered and Repaired
C. G. MEYER & SON, Dept. 2, Tiffin, O.

AUTOMOBILE PARTS

35 H.P. Milwaukee motor \$75.00. B Presto \$10.00. 3-speed Mitchell trans. \$25.00. 6-cyl. 40 H.P. Overland motor \$75.00. 25 H.P. Mitchell motor \$50.00. B-K Mea mag. \$25.00. D 4 Bosch \$35.00. DU 4 Bosch mag. \$30.00. 6-cyl. Thomas motor complete, \$175.00. 4-cyl. Royal Tourist motor, \$100.00. Delco generator and starter, \$35.00. 25 H.P. Maxwell unit-power plant \$125.00. 1909 Regal parts. 34x4 Motz tires \$15.00. 30 H.P. Stoddard-Dayton motor \$85.00. Chalmers unit-power plant \$150.00. DR 4 Bosch mag. \$30.00.

AUTO SALVAGE CO.

1436 Wabash Ave. Chicago

AUTO REPAIR PARTS

E.-M.-F.-30 Buick—10
Mitchell—Model S. Chalmers—Model N
Ford—Model N Mitchell—1908
Brush—Model E Maxwell—Model Q
Maxwell—AA Moon—Model C
Kissel—D9 Pope-Hartford—Model W
Wheels, axles and cylinders for many others.
Prest-O-Lite Tanks—size B.....\$ 8.00
Bucket Seats—per pair.....\$18.00
Many different types and kinds of complete motors and radiators. Write for details.

AUTO PARTS CO.

4125 Olive St. St. Louis, Mo.
No connection with other Auto Parts companies.

AUTO SALES & PARTS

1429 S. State St. Chicago

We wreck 7 to 20 cars a day and can furnish you parts for any make of car at the right price. DR 4 Bosch, \$30; B Presto tank, \$9; demountable rims, all sizes, \$1.75 each; carburetors, all sizes and makes, \$3 to \$10. Write your needs.

AUTO SALVAGE CO.

1418 Main St. Kansas City, Mo.

Buick 10, E. M. F. Flanders, Winton, Overland, and Regal 30. Parts a Specialty.
Motor parts and accessories for almost any make of car.

Write Us Your Needs

Auto Tops, Bodies and Seat Covers

Hand made. We make a specialty of one man tops with Jiffy curtains. Write for prices.

ST. LOUIS AUTO TOP CO.

3029 Olive St. St. Louis, Mo.

BODIES FOR FORDS

1916 Cowl Dash Roadster.....\$40.00
1916 Cowl Dash Touring..... 90.00
Complete with top, top hood, side curtains, floor boards, mat, rear fenders, side and rear lamps, hood support and dash, rear fenders, and windshield.

JOHN C. NAGEL

425-33 Baker St. Detroit, Mich.

BALL BEARINGS REGROUND

One Firm One Service
One Guarantee

Back of Every Bearing Ground by

Ahlberg Bearing Company
2636 Michigan Avenue
Chicago, Ill.

New York
Boston
St. Louis

Cleveland
Detroit
Los Angeles

BODIES FOR FORDS

1916 Cowl Dash Roadster.....\$40.00
1916 Cowl Dash Touring..... 90.00
Complete with top, top hood, side curtains, floor boards, mat, rear fenders and windshield.

LONDON AUTO SUPPLY CO.

2548 Wabash Ave. Chicago

B-O-S-C-H MAGNETOS

DU-6-New\$56.25
DU-4-New 45.00
Remy Model J-4..... 15.00
Splittorf Model X..... 15.00
Briggs (slightly used)..... 8.00
Chalmers 6-cyl. Power Plants.....\$75.00
Schebler Carburetors, 1 1/2 in. "L"..... 8.00
Beaver 6-cyl. Power Plants.....100.00
Studebaker 6-cyl. Motor.....125.00
Roadster, Touring and Speedster Bodies upholstered\$35.00 to \$50.00
Chalmers Bodies, seven different models \$35.00 to..... 85.00
Bucket seats, per pair..... 15.00
Electric Head Lamps, 1 1/2 in..... 5.50
Cylinder Oil, Haver's Special, in bbl. lots, per gal..... .18
Frames, Springs, Axles, Transmissions, Windshields, etc., at low prices. Ask for our prices on tires.

Our Big General Catalog Is Yours for the Asking

THE M. & M. CO.

480-500 Prospect, CLEVELAND, OHIO

CAR BUILDERS AND DEALERS

Send for Specifications on These Parts. We Can Make Some Interesting Prices in Quantities.

250 Car-Nation rear axles, 3 1/2" to 1 ratio, complete.....\$ 25.00
250 Car-Nation front axles (tubular) complete..... 10.00
100 Car-Nation steering gears, complete..... 7.50
25 Sets Car-Nation cantilever springs, per set..... 10.00
39 Marion 35 H.P. motor (crank and pump), each..... 115.00
50 Mighty Michigan 40 H.P. motors, 4 1/2 x 5 1/2..... 150.00
150 Shaft drive transmissions (8")..... 20.00
145 Portland front axles (hubs, bearings and caps)..... 25.00
100 Portland rear axles (with hubs and caps)..... 20.00
30 Dart Sheldon Jackshafts (chain drive)..... 14.00
100 Speedwell steering gears (right hand)..... 15.00
50 Briscoe radiators, 24x24 1/2..... 17.50
34 Truck radiators, 24x33..... 15.00
200 Michigan frames, 145 1/2" long..... .50
850 Hood rests (Krit)..... 2.00
25 Goldberg Mufflers, 16 1/2 x 5 1/2 x 1 1/2" S. B. 200 Splittorf Model "A" Magnetos, each 12.50

Dept. M 1

AUTO PARTS CO.

740 W. Jackson Blvd. CHICAGO, ILL.

COUPE TOPS, \$75 UP—COMMERCIAL BODIES FOR FORD CARS

How to Cut Tire Bills 50 per cent
Write today for full information
VICTOR WAGON & AUTO CO.
1556 S. 7th St. St. Louis, Mo.

F. & H. WIRE WHEELS

Equipped with F. & H. Special Wire Wheel Rims. Adaptable to any car. Complete equipment for Ford cars.

THE F. & H. WIRE WHEEL CO.
Springfield, O.

Ford Dealers and Owners

We manufacture tapered axles for Fords of a particularly tough steel and are the only manufacturers who guarantee that the axles for Fords which we furnish will not crack out in the keyseats for a period of one year, each axle being stamped with the date at time of shipment.

Price, \$2.50 Dealers, regular discounts. We also manufacture Spring Radius Rods, Radiator Cradles, Kant Kum Off Belt Holders, and the celebrated "Anglers Spare Demountable Wheel" for the Ford car.

"ANGLERS"

Streator, Ill., U. S. A.
Agents wanted for our lines

GEARS

Manufacturers for the Trade
Service Gear and Machine Co.
Reading, Penna.

GUARANTEED AUTO SPRINGS

In stock for every model of car back to 1904. Sold at factory prices. The most profitable line for accessory, garages, dealers. Send for our big new price list. Delivery today. The Pittsburgh Auto Spring Company, 5915 Center Ave., East Liberty (Pittsburgh, Pa.).

FALL BARGAINS

Black and nickel elec. head lamps, 1 1/2", \$5.85; mechanical hand horns, guaranteed, \$2.75; motor-driven elec. horns, guaranteed, \$4.65; windshield searchlights, 4 1/2", \$5.85; 7 1/2", \$7.45; one-man Fantasote and Mohair tops, \$28.00; steering gears, \$9 up; Stromberg carburetors, all models and sizes, \$8 up; Schebler model R 1 1/4", \$11; model L 1 1/4", \$8; Marvel Holley or Kingston 1 1/2" carburetors, \$3 each; model B Prest-O-Lite tanks, \$10; Stewart model B speedometers (\$50 list), \$12.50; same with clock and elec. light comb. (\$85 list), \$20.50. Magnetos: Bosch DU 6-cyl. high tension, \$52.50; Elsemann high tension EMIR, 6-cyl., \$42.50; Splittorf model D or X 4-cyl., \$14.75; Splittorf model Y, 6-cyl., \$16.75; Splittorf T.S. transformer coils for above, \$14.75; Rambler motors, second-hand, thoroughly overhauled, guaranteed to be in perfect condition, all models, \$115, with coil, D.W.F. Hess Bright, New Departure, Timken, and other Standard bearings, new, at prices of reground. Send numbers of bearings for prices.

Other Parts and Accessories at equally low prices

RADIATORS

Model T honeycomb, V-shaped, for Ford..\$22.50
Buick 16 and 17, honeycomb..... 33.50
Buick 16 and 17 tubular..... 28.50
Buick 10..... 20.00
Hudson 20, 32 and 33..... 28.50
Chalmers 30..... 30.00
Cuttings, models A and B, 40 and T 35..... 30.00
Colby, models 40 and 50..... 30.00
Rambler radiators, all models..... 28.00

Write for Prices on Other Makes

Automobile Appliance Company
1438 Michigan Ave., Chicago, Ill.

HOW IS YOUR TOP?

Will it stand up this winter? Is the celluloid O.K. in the curtain? If not let us fix it up like new at a very small cost.

CHICAGO AUTO EQUIPMENT CO.

808-10 Jackson Blvd. Chicago

KRIT OWNERS

We furnish quick service on all engine, clutch, transmission, differential, front and rear axle, steering gear, wheels, steering knuckles and cones, fenders, frames, and body parts—from original Krit stock. For all models from 1909-1915 inclusive.

MOTOR CORPORATION

1309 Race St. Philadelphia, Pa.

The Clearing House—continued.

K-R-I-T OWNERS

We have sole possession of all patterns, engineering records, etc., from which Krit cars were made. We alone can furnish prompt, accurate, and dependable service on Krit repairs. Address all mail the same as always to the

KRIT MOTOR CAR COMPANY
Detroit, Michigan

Lozier Repair Parts

We have on hand repair parts for Lozier Cars at reduced prices. Send old parts for replacement.

Philadelphia Machine Works
67-71 Laurel St., Philadelphia

MONEY SAVED

ON AUTO PARTS

Royal Tourist	Flanders	Rambler
Stoddard Dayton	Brush	Auto Cars
Pierce Arrow	Black Crow	Winton
Columbia	Thomas	Maxwell
	Pope-Toledo	

Springs \$1.00 each. Wheels \$1.50 and up. Coils \$1.00 and up. Radiators \$10.00 and up. Remy, Splittorf and other magnetos \$8.00 and up. Bosch magnetos \$30.00. Rear axles \$5.00 and up. Trans. \$5.00 and up.

Royal Tourist motor complete.....\$75.00
Oswald motor complete.....60.00
4-cyl. Cameron air-cooled motor.....20.00

Large Assortment of Other Motors

Universal Auto Parts House

1302 Wabash Ave. Chicago, Illinois

MOTORS

ABSOLUTELY NEW

30 H. P. Unit Power Plants.....\$170.00
Engines only.....125.00
40 H. P. Unit Power Plants.....200.00
Engines only.....155.00
55 H. P. Engines only \$250.00.
All Four Cylinder Four Cycle

Bargains for Quick Sale

Pittsburgh Model Engine Co.

Pittsburgh, Pa., and Peru, Ind.

OIL GROOVE PISTON RINGS

Reboring Cylinders and New Pistons
Agents Wanted

Rittenhouse, Fleury Co.

316 N. Holliday St. Baltimore, Md.

Opportunity Bargains

—BUY NOW—

Demountable wheels, complete, for Ford, per set.....	\$12.50
Keeton wire wheels, 34x4½, each.....	5.00
32x3½, new casings, each.....	8.00
32x4, new casings, each.....	12.00
34x4½ clincher used casings, each.....	6.00
Nickel channel bar bumpers, each.....	4.50
Splittorf Model A magnetos, each.....	10.00
Coil to fit same, each.....	8.50
Bosch ZR-6 magnetos.....	50.00
V-shaped radiators, for Ford, each.....	23.00
Justrite tire tools, each.....	.45
Rajah Spark Plugs, ½", each.....	.60
Sure fire spark plugs, each.....	.20
Cementless patches, per box.....	.15
Side oil lamps, per pair.....	3.00
Foot warmers, each.....	1.00
All wool robes, each.....	5.50
Krit radiators, 1911-1912-1913.....	13.50

Send for Our Bulletin of Bargains

U. S. Auto Supply Co.

859 Woodward Ave. Detroit, Mich.

NO TIME

Like the Present

To get your car in condition start right and order a set of Guaranteed Spark Plugs. All sizes—six for 90c.

Magnetos

Bosch DU4.....	\$35.00
Eisemann BD—with kick switch coil.....	25.00
Eisemann straight high tension.....	20.00
Remy—Models S, RF, RD.....	10.00
Splittorf.....	10.00
Briggs—4-cyl.....	6.00
Michigan.....	6.00
Dyneto—6-volt lighting generators.....	12.00

Coils

Splittorf Box Coils—kick switch.....	6.00
Eisemann kick switch.....	8.00
Remy Coils.....	6.00
Bosch—Duplex.....	8.00
Bosch—kick switch.....	10.00
Briggs—kick switch.....	6.00

Mohair Tops built to order for any car.

Complete with top boot and Collins curtains, Roadster.....	16.00
4-Passenger.....	22.50
5-Passenger.....	25.00
7-Passenger.....	30.00

Specials for Fords

Bull nose Radiators—with stream-line hoods.....	42.50
Straight-front Honeycomb Radiators.....	18.00
Stream-line hoods with hood rest.....	6.50
Bosch Magnetos.....	25.00
One-man Mohair Tops—Complete.....	25.00
Regular tops with Collins curtains.....	16.00
Crown Fenders—set.....	12.00
Demountable wheels—set of four with five rims.....	12.00
Speedster bodies—complete with fenders, seats, tank, tool-box, and stream-line hood.....	85.00
30x3 regular front wheels.....	.75
30x3½ regular rear wheels.....	1.50
Special ratio gears—2¼ to 1; 3 to 1 ring gear and pinion.....	15.00
Cowl Windshields—complete.....	13.50

Miscellaneous

18" Steering Wheels.....	2.00
Stewart Speedometer Shafts—Complete.....	1.25
Stromberg Carburetors.....	8.00
Schebler 1½" and 1¼" Model L.....	8.00
Rayfield H-3, 1½".....	9.00
Schebler Model D—side intake.....	3.00
Holly—1" top intake.....	3.00
Kingston 1" and 1¼".....	3.00
Jacox Steering Gears—complete with 18" wheel, R. H. drive.....	10.00
Prest-O-Lite Tanks—Model B.....	10.00
Prest-O-Lite Tanks—Model E.....	8.00
34x4 Q. D. Wheels.....	2.00
36x4½ Wheels—complete with Baker Demountable rims—set of 4 wheels and 5 rims.....	20.00
Baker rims—all sizes—prices right.	
Weed Chains—all sizes	
Trailers—for all cars.....	45.00

—Watch for Our Weekly Surprises—

AUTOMOBILE SPECIALTY COMPANY

999 Woodward Avenue, Detroit, Mich.

Pope-Hartford Parts

Parts for all models of Pope-Hartford pleasure cars, Trucks and Public Service cars—made from the original drawings and patterns, with the original tools, fixtures, etc.—complete stock always on hand, prompt and satisfactory service.

The Hartford Motor Car Company
408 Main Street, Hartford, Conn.

Radiators

At Lowest Prices in the United States

Plain to fit Ford cars.....	\$18.00
"V" shaped to fit all Ford cars.....	24.00
Buick 10 (give year).....	21.50
Hudson 20.....	30.00
E. M. F. 30.....	30.00
Hupmobile 20.....	22.50
Oakland 1911.....	30.00
Overland 59-69-T-40-82.....	31.00
Regal MT Underslung M-20-FL-MS.....	36.00
Studebaker 35.....	32.00

Plain or "V" Shape Radiators for Any Car. If Your Car Is Not Listed Write for Special Quotations.

AUTO RADIATOR MFG. CO.

764 Van Buren St. Chicago, Ill.

RIMS—ALL MAKES AND TYPES

Parts for all old types, including Goodyear '7. Largest distributors. Dealers—Write for Prices.

CITY AUTO TIRE & SUPPLY CO.
2352 Euclid Avenue Cleveland, Ohio

RIMS—ALL NEW AND OLD TYPES

and all necessary parts. Special price this month on Goodyear clincher and Dunlap rings. State make and year of car, also style and the tire size when ordering.

W. P. KASTNER, 2125 Michigan Ave., Chicago

SHIP THAT TROUBLESOME CARBURETOR by Parcel Post. We rebuild and install new parts. Factory testing methods used. Service Station for Rayfield, Schebler, Stromberg and Holly. All work guaranteed. **Wills, Carburetor Specialists**, 358-360 Belleville Ave., Newark, N. J.

SPEEDWELL OWNERS

And Garages Repairing Speedwell Cars
We have the patterns and records of SPEEDWELL cars and trucks and can give you the best service on parts.

SPEEDWELL AUTO PARTS CO.
1234 E. 3rd St. Dayton, Ohio

STOCK GEARS

TRANSMISSION GEARS for over 100 makes of cars. Obsolete, Orphan and Current models, Case, Cadillac, Elmore, Moline, Maxwell, Marathon, Regal, Selden, Studebaker, etc. DIFFERENTIAL GEARS and parts for Buick, Case, Chevrolet, Cutting, Elmore, Hudson, Marathon, Maxwell, Oakland, Regal and 100 others. General line of repair parts for old MAXWELL cars, at old list price.

Dealers and repairmen, get our price list and make a profit on your repair parts.

AUTO GEAR & PARTS CO.
1777 Broadway 1461 S. Michigan Ave.
New York, N. Y. Chicago, Ill.

MOTOR PARTS SUPPLY CO.
275 Marietta St., Atlanta, Ga.

We advertise what we have, and have what we advertise. No second-hand parts or junk.

The Clearing House—continued.

The Enterprise Mfg. Co.

Akron, Ohio Dept. 39 U. S. A.
ESTABLISHED 1881
Paid in Capital \$425,000.00

Contract Manufacturing in METAL GOODS

Special Parts to Order

Metal Stampings

Wire Forming and Pointing
Screw Machine Products
Expert Die Makers

Buffing, Polishing, Plating & Special Finishes

NOTICE—Estimates cheerfully furnished upon receipt of drawings, specifications or samples—the latter preferred.

Transmissions, Axles & Frames

CROXTON KEETON transmissions with levers \$75.00
KRIT 1915 with multiple disc clutch and levers 50.00
KEETON 4-speed center control with lever 75.00
HAYNES 3-speeds up to 50 H.P. 70.00
WESTON-MOTT rear axle (full floating) 85.00
WESTON-MOTT semi-floating, complete... 45.00
CAR-NATION (light car type) complete... 25.00
PORTLAND rear axle (one-ton truck) complete 25.00
ELMORE front axle 30" centers, complete 14.00
WESTON-MOTT 28½" centers, complete... 10.00
DEMOT (couched type), complete..... 10.00
STERLING frames, 150" long, 32" wide... 12.50
MIDLAND 140½" long, 28½" centers..... 12.00
CROXTON 151½" long, 30" and 33" wide. 14.00
All chassis parts in stock. Get our bulletin of bargains before buying.

AUTO PARTS COMPANY

740 W. Jackson Blvd. Dept. M1 Chicago, Ill.
See Our Other Ad for Bargains in Motors

—WANTED—

Parts for Ford Cars by large Southern Hardware Jobbing House. Address T. R. F., care this office.
KING HARDWARE CO., Atlanta, Georgia

WANTED

To buy four and six cylinder motor separately or old cars with serviceable motors in them. Please give best cash price and full description in first letter.

GREER COLLEGE OF MOTORING
1519-21 Wabash Ave., Chicago, Ill.

WAR ON HIGH PRICES

Recover your own auto top and save money. We furnish complete outfits for all makes of cars ready to slip on.

Roof and back complete for Ford touring... \$ 6.45
Roof and back complete for Ford runabout... 5.45
Radiator covers, felt lined, for Fords, each 1.25
Seat and door covers for Ford touring... 7.50
Seat and door covers for Ford runabout... 5.50
Mohair one man top with Jiffy curtains and dust cover for Ford touring..... 25.00
Prices quoted on seat covers for all cars.
Racing seats upholstered, all sizes, pair... 14.00
Complete tops for all makes of cars, mohair or auto leather, runabout \$15.00; touring 30.00

A. A. TOP MFG. CO.

1443-5-7 Washington Boul., Chicago, Ill.

We Are the Largest Dealers of Parts in the State

Send us a list of parts you need for your old car. We have them. Price one-half.

CHICAGO AUTO SALES CO.

1424-26 S. Michigan Ave., Chicago, Ill.

YOUR FORD MOTOR gives more speed with less noise if our BULLDOG Adjustable Valves are used. \$0.50 each, \$8.75 per set of eight postpaid.
ARCHER MFG. CO., Rutland, Vt.

WE TEAR 'EM UP AND SELL THE PIECES

We Can Save You Money on Repair Parts or Supplies for Your Auto.

MOTORS

Continental, 30 H. P. \$75.00
Oswald, 4-cyl., 4x4½ 75.00
Moon, model C, 4½x5½ 75.00
Regal 30, 4x4 75.00
Bergdoll Unit Power Plant, 3½x4½ 150.00
Mitchell, 6-cyl., 50 H. P. 150.00
Mason-Maytag, 2-cyl. with Trans. 35.00
Reo, 2-Cyl. with Trans. 35.00
Maxwell D or D-A, Unit Power Plant... 75.00
One new 4-cyl. 12 H. P. motor. 75.00
One Stoddard-Dayton, Model 8-H, 20 H. P. \$65
Above are used motors, guaranteed to be in good shape. Will take other motors in on trade

Our stock changes each day. If you are in need of a motor and any of the above don't suit, write us; we may have it.

Can supply you with Crank Cases, Crank Shafts, Cam Shafts, Cylinders, Pistons, Connecting Rods, Radiators, Gears (any style), Timers, Magnets, Coils, Carburetors, Manifolds, Water Pumps, Transmissions, Rear and Front Axles, Wheels, Steering Gears (complete), Steering Wheels, Gasoline Tanks, Wind Shields, Springs, Bodies, Seats and Cushions, Jacks, Tires and Tubes, Head Lamps, Side Lamps and Tail Lamps (any style), Prest-O-Lite and Search Light Tanks, Horns, Mufflers—in fact, any part of an auto.

OUR GUARANTEE TO ALL—IF NOT SATISFIED WITH YOUR BARGAIN, RETURN AND WE WILL REFUND YOUR MONEY.

We also buy old autos—condition no object—or any part of an auto, or if you want to trade parts we will trade with you.

AUTO WRECKING CO.

Old Church, 13th and Oak
KANSAS CITY, MO.

1910 D. FRANKLIN PARTS

Half list price. Used. Good as new. Sent C. O. D. privilege of inspection. Write for list of parts on hand. E. A. BARNES, 305 PATTERSON BUILDING, OKLAHOMA CITY, OKLAHOMA.

PATENTS & PATENT ATTORNEYS

C. L. Parker, Patent Attorney

Formerly member Examining Corps, U. S. Patent Office, 960 G St., Washington, D. C.
Pamphlet of instruction sent upon request

PROTECT YOUR IDEAS

Send for free book and free search plan
MILO B. STEVENS & CO.

53 W. Jackson Blvd., Chicago
Established 1864, 635 F St., Washington, D. C.

JOHN M. McLACHLEN

ATTORNEY AT LAW PATENT CAUSES
Union Trust Building
WASHINGTON, D. C.

PORTABLE GARAGES

\$62.50 GARAGE \$62.50

10x12 SPECIAL FOR FORD CARS 10x12
2-foot width, \$10.00 extra, 2-foot length
GARAGE CONSTRUCTION COMPANY
Grant & Oliver Ave. Pittsburgh, Pa.

RADIATOR AND LAMP REPAIRING

A New Radiator or Your Old One repaired. Repairs in one day—a new radiator in two days. We are specialists also on fenders, hoods, gas tanks, lamps and all auto sheet metal work.

WABASH AUTO RADIATOR MFG. CO.
(Harrison 4126) 1137 Wabash Ave., Chicago, Ill.

All Our Radiator Repairing Guaranteed

Quick Service, Skilled Workmanship and Reasonable Prices in Our Radiator Repair Department have gained us the patronage of the majority of the automobile trade throughout the country.

HONEYCOMB RADIATORS
of the Highest Quality. By dealing directly with Radiator Manufacturer save from 30% to 50% on new radiators and cores. Write for prices.

Illinois Auto Sheet Metal Works

1712-14 Michigan Ave. Chicago, Ill.

ARROW RADIATOR CORES

Positively will NOT BURST if frozen, yet Arrow Cores give 100% expansion and cooling efficiency. Installed in all makes of radiators—Radiators Repaired.

ARROW RADIATOR CO. Chicago
1331 Wabash Ave.

Auto Radiators and Fenders Repaired
We have just opened our new factory equipped with the latest machinery for high class work. Prompt service. Low prices. Write for prices on special work.

GUARANTEE AUTO REPAIR CO.
1521 Prospect Ave. Cleveland, Ohio

AUTO RADIATORS REPAIRED

and rebuilt to look like new. All work guaranteed. Quick Service. Low Prices.

AUTO RADIATOR CO. Chicago
114 N. Crawford Ave.

CHICAGO AUTO SHEET METAL WORKS

2301 Wabash Ave., Chicago
Radiators repaired and rebuilt to look like new. Fenders, hoods and gas tanks manufactured. All work guaranteed; if it isn't right we will refund your money. Prompt service.

CHICAGO MFG. CO.

1458-60-62-64 Michigan Ave., Chicago
We are the only radiator manufacturers in Chicago making a square tube radiator. New guaranteed cores placed in old radiators. We also manufacture Hoods, Fenders, Tanks and Pans and do guaranteed repair work. Prompt service.

EUREKA DIAMOND HONEYCOMB RADIATORS

For any Make of Car
For Ford cars. Absolute satisfaction guaranteed. The BEST that money and brains can produce. V type in polished brass, and nickel. Flat face in polished brass and nickel. Lowest prices on the market. Discount to jobbers and the trade.

Eureka Auto Parts Co.
1918 Pine St. St. Louis, Mo.

ONLY RADIATOR FACTORY IN NORTHWEST

Pioneer manufacturer. Why send your radiator down east when you can ship it to us, save time, expense, freight, money and get best workmanship? Prices—right. Make new radiators, allow for old one.

TODD MANUFACTURING CO.
820-824 Mary Pl. Minneapolis, Minn.

The Clearing House—continued.

LOUISVILLE AUTO RADIATOR & LAMP REPAIR COMPANY

Best work, reasonable prices; all work guaranteed.
419 West Green Street Louisville, Ky.

RADIATORS REPAIRED

Any make or style. We are specialists and guarantee satisfaction. Out-of-town orders receive prompt attention.

F. C. ROHDE, 4135 Olive St., St. Louis, Mo.

SHEPPARD MANUFACTURING CO.

1331 Jackson Boulevard, Chicago

AUTO RADIATORS MANUFACTURED for any make of car

RADIATORS REPAIRED

Leaking and wrecked radiators made equal to new. New cores or any part fitted in any radiator. Hoods, Fenders, Tanks made to order. GUARANTEED WORK—QUICK SERVICE. Write for prices. Phone Haymarket 4037

WE MANUFACTURE AND REPAIR

Radiators, Fenders, Hoods, Gas Tanks and Lamps. Prompt guaranteed work at the right price. Write us today.

SOUTH SIDE AUTO RADIATOR MFG. CO.
59 E. 43rd St. Chicago

W(RIGHT) RADIATORS

Have stood the test of years—most durable and efficient. Get the best at less cost than others. Don't order until you send for our prices, and illustration of construction. Honeycomb and Bridge Fin Types (tubular). All standard makes in stock. Exceptionally low prices on Fords. Dealers' discount.

Wright Cooler & Hood Co.

1253 Michigan Ave. Chicago, Ill.

REBUILDING AND REPAIRING

AAA SCORED CYLINDER

Repaired by patented electric process. Filled with silver and nickel composition. Same pistons and rings used. No warping or enlarging of cylinder bore. L. LAWRENCE & CO., 292 Halsey St., Newark, N. J.

Butler's Special Alloy Pistons

Are durable, and stronger than cast iron. Cylinder grinding, cast iron or alloy pistons, piston pin bushing, standard and oversized valves. Quality work is our motto. Write today.

BUTLER MFG. CO.

Est. 1897 Knightstown, Ind.

Crankshafts, Crankcases, Connecting Rods, pistons, scored cylinders made equal to new with our New Silver Iron process—use the same piston and rings.

POWELL-ELLIOTT AUTO REPAIR CO.
143 Rogers Ave., cor. Sterling Pl., Brooklyn, N. Y.

CYLINDERS

REBORED AND REGROUND

Fitted with light cast iron pistons and McCadden leakless rings, new pins, bronze bushing. Weight of Buick 10, 1½ pounds, Ford, 1¼ pounds, Hudson 83, 2¼ pounds. Absence of vibration, quiet, smooth. Any make car.

McCADDEN MACHINE WORKS
St. Cloud, Minn.

Cylinders Rebored and Reground

And fitted with new pistons and rings—any motor. Oversize valves and piston pins and bushings. Everything for the Automobile motor. We are specialists and guarantee first-class work. The best equipped Automobile Repair and Machine Shop in Southern Indiana.

Write for Prices
Magnetos Recharged and Repaired
VINCENNES MOTOR MFG. CO.
Vincennes, Indiana

CYLINDER GRINDING

Either cast iron pistons and rings or our special light alloy pistons and rings furnished. State make of car in writing.

STAFFORD MOTOR CO.
2201-2209 Campbell Ave. Kansas City, Mo.

CYLINDER GRINDING

Cylinders ground and fitted with new pistons and rings. Most completely equipped shop in the west. Patterns free. Guaranteed work. Quick service.

A. H. SULLIVAN & CO.

4143 to 4149 La Clede Ave., St. Louis, Mo.

CYLINDER GRINDING

on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them.

Oxy-Acetylene Welding of cracked cylinders a specialty

ADAPT MACHINERY CO.

1624 So. Wabash Ave. Chicago, Ill.

CYLINDER GRINDING

Special Light Alloy Pistons

Our special facilities enable us to do highest grade work. Over 225 piston patterns.

AUTO ENGINE WORKS

ST. PAUL, MINN.

CYLINDERS REBORED AND REGROUND

Fitted with my heat treated light weight pistons and patented three section rings.

From \$6 to \$15 per Cylinder

Ford cylinders reground, fitted with new piston rings, wrist pins and bushings for \$20.00.

TRUMP MANUFACTURING CO.

Crown Point, Ind.

CYLINDERS REBORED

Including new pistons and rings, \$7 to \$11 per cylinder. General overhauling and repairing. Welding. Cylinders, Crank Cases and Crank Shafts welded.

STERLING ENGINE COMPANY

331 So. Clinton St. Chicago, Ill.

CYLINDERS REGROUND

and fitted with Special Composition heat-treated rings and heat-treated pistons, \$7.00 to \$15.00 per cylinder. Ford cylinders reground and fitted with Standard weight pistons, \$18.00. Special light pistons, \$24.00. Oxy-Acetylene Welding.

BERNHARD & TURNER AUTO CO.
Des Moines, Iowa

CYLINDERS REGROUND

Including new pistons and rings for \$5 to \$11 per cylinder. We do this class of work exclusively and are thus able to give you the highest class of work at these prices. Ford cylinders reground, including new pistons, rings and wrist pins, for \$20.00.

THE CROWN MACHINE SHOP

Crown Point, Ind.

CYLINDERS REBORED

With new Pistons and Rings fitted, \$8 each. Crankshafts turned. Gears made. Fine machine work.

SALTER MOTOR MFG. CO.
1518 Oakland Ave. Kansas City, Mo.

LEE W. OLDFIELD

Minneapolis, Minnesota
Extra light reciprocating parts and accurate cylinder grinding my specialty.

SPECIAL PISTONS FOR FORD CARS

That enable you to carry a gallon more oil in your crankcase. We positively guarantee oil will not seep your spark plugs. Cylinders reground. Pistons made and fitted. General machine shop work.

WM. DOMINICK & CO.,
1607-1611 Prairie Ave., Chicago

WE THOROUGHLY OVERHAUL

TRUCKS AND PLEASURE CARS
REBORING OF CYLINDERS, furnishing new pistons and rings at lowest possible prices. SCORED CYLINDERS repaired by our electric process and thoroughly guaranteed.

WELDING OF CYLINDERS, crank-cases and all parts of cars. We are automobile specialists. Write for booklet.

HUB MACHINE CO.
22nd and Race Sts. Philadelphia, Pa.

WE REGRIND CYLINDERS

Furnish our heat treated piston rings and pistons. First class equipment, 15 years' experience. Write for our prices.

BRIDGEPORT PISTON RING CO.

Bridgeport, Conn.

SCHOOLS

FREE BOOKLET—"How to Succeed in the Automobile Business" on application. \$40,000 equipment—eight instructors—actual work, repairing and driving—Day and evening classes.

GREER COLLEGE OF MOTORING
1456 Wabash Ave. Chicago

STORAGE AND SHIPPING

P. BRADY & SON CO.

Trucking and Storage. Automobile and Bodies Stored. Automobiles boxed for export.
552-558 W. 58th St., New York
Telephone 3440 Columbus

SUPPLIES AND ACCESSORIES

A STARTER FOR FORDS

An Automatic Engine Starter Which Spins Your Motor

Write for Illustrated Circular

ANDRE G. CATELAIN
1446-8 Indiana Ave. Chicago, Ill.

AUTO SEAT COVERS

AUTO TOPS AUTO CUSHIONS
TOP DUST HOODS

For all makes of cars. Sit right down and write for our samples and price list

Best Materials High Class Workmanship
We maintain a separate department for repairs

WESTERN AUTO TOP CO.

1913-1933 Harney St. Omaha, Neb.

Bargains in Self-Measuring Gasoline Pumps

1 Gilbert & Barker self-measuring gallon discharge pump, never used, cost \$75, will sell for \$35. 1 Bowser No. 125, half-gallon discharge pump, brand new, fitted with meter, cost \$82, will sell for \$35. 1 American self-measuring half-gallon discharge, double-acting pump, never used, will sell for \$35. 1 Bowser No. 41 self-measuring gallon-discharge pump, has been used but in first-class condition, cost \$75, will sell for \$35. 1½" brass foot valve for tank for any of the above pumps, \$3.50 each.
Address W. H. Dutton, Cedar Rapids, Iowa

Cocoa and Carpet Mats, Hand Made Seat Covers, Auto Tops Built and Repaired

AUTO CAPE TOP CO.

2334 Michigan Ave. Chicago, Ill.

Paint Your Car Yourself

Save \$25 to \$75 by doing the work at home with the Arsenal system. Our big free booklet, "The Car Beautiful," tells how. Send for it today.

Arsenal Varnish Company
Auto Dept. Rock Island, Ill.

The Clearing House-continued.

INVENTORY SALE

The following are just a few of the many accessories. We can save you money—our money-saving bargain sheet just out. Send for one. Complete set shock absorbers for Fords.

List price \$15.00; sales price.....	\$ 2.75
Lamps, all types.....	.75 up
Vulcanizers.....	.75
Racing Seats.....	7.00
Demountable Wheels with extra rim,	
per set.....	12.75
One-Man Tops.....	21.00
Complete with JIFFY Curtains.	
Windshields, up-to-date.....	7.50 up
New Radiators.....	18.00 up
Commercial Bodies.....	15.00 up
Storage Batteries, all sizes, half price.	
Inner Liners.....	1.10 up
Our Limousine Tops for Ford Cars.....	77.50
Our Guaranteed Quality Tires Save You 30%	

STERLING TIRE & SUPPLY CO.

14th & Michigan Ave. Chicago

Reduced Prices on Supplies

Desirous of cleaning up a few lots we have on hand, therefore will offer them at specially reduced prices.

Call and look over our stock. We have the most complete "Automobile Plant" for retail business in the world. Everything from a cotter pin to a complete car.

A Few of Our Specials Are:

1-Man Tops (all years), \$25.00; Windshield, \$8.00; Self-starter, \$6.50; Shock Absorbers, \$3.85 (set); Tool Boxes, 75c and up; Speedometers (Stewart), \$6.45; Sloping Hoods, \$6.00; Lamp Sets, \$4.25 up; Demountable Rim Sets (painted or natural wood), \$12.50; New Runabout bodies, \$35.00; Carburetors, \$5.00 up; Remy complete dual system magnetos, \$25.00; Splittors, \$17.25; Bearings, \$1.00 up. (Bring in old one and we will duplicate at a great saving). Electros Horns, \$1.63; Rims, all kinds and sizes, at a big reduction; Electric Lamps, \$5.50 pair; Windshields, \$9.00; Spark Plug Pumps, \$3.75; Prestolite Tanks, \$7.00; Pyrene Fire Extinguishers, \$5.50; Lap Robes, \$1.85; Gloves, \$1.00; Spark Plugs, 16c; Wrenches, 8c up; Clocks, 90c; Mirrors, 60c; Storage Batteries, \$7.00; Fur Coats, \$15.00; Tops, \$15.00; Sweaters, \$2.00; Trunks, \$5.00; Dashboards, \$1.00; Runabout or Racing Seats, \$8.40-\$16.00; Wheels, \$1.00; Bodies, \$35.00; Transmissions, \$20.00-\$45.00; Axles, \$10.00.

MOTORS, FRAMES, STEERING GEARS, WHEELS AND SPRINGS FOR ALL CARS.

TIMES SQUARE AUTO. CO.

WORLD'S LARGEST DEALERS
BROADWAY & 56TH ST., NEW YORK
1210 MICHIGAN AVE., CHICAGO

Safety Starters for Fords Now \$7.50

Fred Allen Auto Supply Co.

1610 Michigan Ave. Chicago, Ill.

TIRES

ANNUAL TIRE SALE

In Guaranteed and Used Tires

Size	Used	New	Size	Used	New
30x3.....	\$4.50	\$6.00	34x4.....	\$8.00	\$12.00
30x3½.....	6.00	7.80	34x4½.....	10.00	17.80
32x3.....	6.00	7.00	36x4½.....	10.00	17.90
32x3½.....	9.00	11.85	37x5.....	12.00	21.00

10% deposit with order, balance C. O. D. subject to examination

This Week Only

200 32x3½ Straightside Plain Tread....\$6.75 ea.
ACME TIRE AND REPAIR CO.

1547 Michigan Ave. Chicago, Ill.

BE WISE — SAVE MONEY

on Your TIRE BILLS by Using Our
DOUBLE SERVICE TIRES

For full particulars and price list address

I. JAFFESS

1319 Fifth Ave. New York City
Branch at 282 Halsey St., Newark, N. J.

THE REAL SHOE

Will save you from carrying an extra casing. Special treated wire reinforcement makes the inside shoe of great value in all cases of tire trouble, and can be used indefinitely. Made in all sizes and mailed to any part of U. S. prepaid. 75c each. Dealers, write for special prices.

W. T. MILLER, MFR.

148 No. Delaware Indianapolis, Ind.

Double Your Tire Mileage

No Punctures or Blowouts

Our specially constructed liner does the work. Guaranteed for life—interchangeable from a worn-out casing to new one. Special for Ford Cars, \$6.75 prepaid. Made for all sizes of tires. Prices on request.

Kriescher-Moon Sales Co.

1220 Wabash Ave. Terre Haute, Ind.

Pre-Inventory Sale

Tires Tubes

All Fresh Selected Stock—All Firsts

The quality and service feature in these tires and tubes are the same as featured in the tires you are now paying high prices for. The following price list buys quality goods:

Size	Tires	Tubes
28x3	\$5.50	\$1.25
30x3	6.00	1.85
30x3½	7.50	2.10
31x3½	8.00	2.25
32x3½	8.50	2.25
34x3½	9.00	2.30
36x3½	10.25	2.50
31x4	11.50	2.80
32x4	12.00	3.00
33x4	12.25	3.05
34x4	12.75	3.15
35x4	13.00	3.25
36x4	13.50	3.30
34x4½	15.75	3.80
35x4½	16.50	4.00
36x4½	17.00	4.10
37x4½	17.50	4.15
36x5	18.00	4.80
37x5	19.50	5.00

For Non-Skids add 10% to above prices.

We also have 500 slightly used and demonstrating tires and tubes, all sizes that are positively guaranteed which we are closing out in this sale.

Size	Tires	Tubes
30x3	\$3.00	\$1.25
30x3½	3.75	1.35
31x3½	4.25	1.40
32x3½	4.50	1.40
34x3½	5.00	1.50
31x4	4.25	1.40
32x4	6.00	1.50
33x4	6.25	1.50
34x4	6.75	1.60
35x4	7.00	1.75
36x4	7.00	1.75
34x4½	7.25	1.75
35x4½	7.50	1.80
36x4½	7.50	1.85
37x4½	8.00	1.90
36x5	8.25	1.90
37x5	8.50	2.00

All goods shipped C. O. D. subject to examination on receipt of 10% of order.

We pay express charges only when money order in full accompanies order.

All shipments made promptly. To avoid delay kindly mention style of your rim when ordering tires, as we have them in straight side, clincher and Q. D. clincher.

Tire Repair & Supply Co.

1463 Michigan Ave., Chicago, Ill.

NEW TIRES SLIGHTLY USED TIRES DOUBLETREAD TIRES AT BARGAIN PRICES

Send for Our Bargain Catalogue
AUTO SALES AND PARTS

1429 So. State St.

Chicago

RECLAIMED TIRES

SAVE MONEY ON YOUR NEXT TIRE BILL

By Sending Us 2 Old Tires

We take two tires, one which is road-worn, but has good beads, and another which is rim-cut but has good tread and lock the side walls by our own special process, making a double tread tire good for thousands of miles.

PUNCTURE-PROOF AND WATER-PROOF

Our Special Process Stays

We ship C. O. D. subject to examination at the following prices:

SIZE	If You Furnish Both Casings	33x4	38x4
30x3	\$2.75	35x4 34x4.....	4.25
32x3	2.75	38x4 34x4½.....	4.50
30x3½	3.00	37x4½ 35x5.....	5.00
32x3½	3.00	38x4½	5.25
34x3½	3.25	40x4½ 42x4½.....	5.50
36x3½ 30x4.....	3.50	36x5 37x5.....	5.50
31x4 32x4.....	3.75		

Small additional charges when inner shoes are required. Send us your old tires.

THE GEORGE R. CARTER CO.

Connersville, Indiana

SAVE YOUR OLD TIRES

Send us 2 OLD TIRES, one with a good bead and the other with a good tread, and WE WILL COMBINE them by our DOUBLE TREAD SYSTEM into a SOUND ONE for a cost of from \$2 to \$4, according to size.

If you have ONLY ONE tire in this shape we can FURNISH you with the OTHER ONE for a cost from \$4 to \$9. If you have NO OLD TIRES to have remade you can ORDER READY REMADE ones that we carry in stock from \$4 to \$12. POSNER & BLOCK

1211 Bedford Ave. Brooklyn, N. Y.

TIRES

WE SELL

Akron Tires

Everybody knows what AKRON TIRES are—they have used them for years. No argument necessary.

Largest Stock; Lowest Prices

Size	Plain	Tubes	Size	Plain	Tubes
28x3.....	\$5.00	\$1.80	34x4.....	\$9.00	\$3.20
30x3.....	5.00	1.90	35x4.....	10.00	3.30
30x3½.....	6.50	2.15	36x4.....	10.00	3.35
32x3½.....	7.50	2.25	34x4½.....	12.00	4.00
34x3½.....	8.00	2.35	35x4½.....	12.50	4.10
31x4.....	8.75	2.95	36x4½.....	13.50	4.15
32x4.....	8.50	3.05	37x4½.....	14.00	4.25
33x4.....	9.00	3.10	36x5.....	15.00	4.95
			37x5.....	16.00	5.05

Non-Skids \$1.00 Extra; All Sizes

EXPRESS CHARGES PREPAID

only when money accompanies order in full.

10% required on C. O. D. orders

AKRON TIRE CO., Inc.

Authorized Capital, \$300,000.00

1789 Broadway, Corner of 58th St.
NEW YORK

SAVE MONEY

Send us your discarded tires. We make them over at a cost that is about half the rate you pay using new tires.

WILCOX BROS.

3019 Michigan Ave.

Chicago

The Clearing House—continued.

12-PLY DOUBLE TREAD TIRES

Our method creates a smooth interior surface which DOES NOT HARM the inner tube as many other make double tread tires do.

A TRIAL IS ALL WE ASK. SEND NO MONEY.

Just send two old used tires. We assure you the service of a new tire from two old ones. Drop us a postal. We will mail you our addressed shipping tag. Attach same to your old tires, turn them over to your express. They will come to us. We will immediately write to you, stating just what we can do with them and at what price, and upon advice will Twelve Ply same and send them to you C. O. D.

List for making your old tires into Twelve Ply Double Tread:

28x3.....\$2.00	35x4.....\$3.40
30x3.....2.25	36x4.....3.50
30x3 1/2.....2.50	34x4 1/2.....3.60
31x3 1/2.....2.60	35x4 1/2.....3.70
32x3 1/2.....2.70	36x4 1/2.....3.80
34x3 1/2.....2.80	37x4 1/2.....3.90
31x4.....3.00	35x5.....4.00
32x4.....3.10	36x5.....4.00
33x4.....3.20	37x5.....4.00
34x4.....3.30	37x5 1/2.....4.00

Carried-in-Stock Prices:

28x3.....\$3.90	35x4.....\$7.99
30x3.....4.48	36x4.....8.00
30x3 1/2.....4.48	34x4 1/2.....9.20
31x3 1/2.....5.56	35x4 1/2.....9.60
32x3 1/2.....5.72	36x4 1/2.....10.00
34x3 1/2.....6.04	37x4 1/2.....10.40
31x4.....6.52	35x5.....10.80
32x4.....7.00	36x5.....11.00
33x4.....7.40	37x5.....11.20
34x4.....7.80	37x5 1/2.....11.60

For non-skid add 10 per cent to above. We will ship tires C. O. D. subject to inspection. Send \$1 deposit for each. Specify the make of your rim.

When inner shoes or patches are required they are put in at a nominal charge of 25 to 50 cents each. Express must be prepaid on tires sent us. We reserve the right to reject tires not suitable.

We carry used and dem. tires in stock. Also new and used tubes.

Open Sunday, 8 to 12; Evenings Until 7 P. M.

12-PLY TIRE STATION

Chicago Branch Office and Station
1311 Michigan Ave., Chicago, Ill.

A GREAT TIRE AND TUBE SALE

100 makes, 15,000 tubes and shoes. New and A1 stock. At ridiculously low prices. Saving from 40% to 70%. Cheapest house in the city.

JANDORF AUTOMOBILE CO.

1764 Broadway New York City

SAVE YOUR OLD TIRES

Good for 3,000 to 4,000 Miles

We take two of your old tires and rebuild them into one tire good for several thousand miles. Do not confuse this process with the "sawed-on" or "half-soled" tread being put out by many vulcanizers. With our TWO-IN-ONE PROCESS the tire has the appearance of any other casing after being put on wheel. Many users are now getting excellent service from discarded tires. Why not you?

Our Prices

30x3.....\$2.50	34x4.....\$3.75
30x3 1/2.....2.75	35x4.....3.75
31x3 1/2.....2.75	36x4.....4.00
32x3 1/2.....2.75	34x4 1/2.....4.00
34x3 1/2.....3.00	36x4 1/2.....4.25
31x4.....3.00	35x5.....4.50
32x4.....3.25	36x5.....4.75
33x4.....3.50	37x5.....5.00

Small additional charges for necessary repairing. Send no money, but send us two old tires for a trial order today.

INTER-STATE TIRE REPAIR SHOP

Bethany, Missouri

WELDING

AMERICAN WELDING CO.

86 Woodbridge St. Detroit, Mich.
We weld broken parts, guaranteeing them to have their original strength. Our prices are consistent with good high-grade work. Estimates gladly furnished on any kind of Welding.

Absolutely Guaranteed Welding

We absolutely guarantee all work done by the OXWELD PROCESS of welding and cutting, including welding cracked or defective cylinders, crankshafts, housing, aluminum crank and transmission cases, etc., etc. Estimates furnished on job and contract welding and cutting of all kinds.

OXWELD ACETYLENE COMPANY
36th St. and Jasper Pl., Chicago, Ill.

DON'T WELD Aluminum

USE WELDUM

High Temperatures Cost Money
Weldum can be used in any garage by mechanic or owner, as it is applied by torch. Do your own work and eliminate oxy-acetylene prices. Weldum is used all over the world.
Per lb.....\$3.50 Sample piece.....\$1.50
Parcel post

THE WELDUM CO.
25 West 42d St., New York City

DO YOUR OWN WELDING

Our regular \$75.00 Oxy-Acetylene Welding Outfit, brand new. The very best regulators, torch, hose, supplies, instructions, etc., complete, all ready for work, except tanks, \$30. Terms, Cash with order or C. O. D. Welding Apparatus Company, 1013 Monroe St., Toledo, O.

Oxy-Acetylene Welding Automobile and Machinery Parts

WELDED AND MACHINED
Cracked Cylinders & Specialty
ADAPT MACHINERY CO.

1624 Wabash Ave. Chicago, Ill.

WE DO WELDING

others cannot do on parts of aluminum or cast iron. Expert auto repairmen dismantle and re-assemble jobs. Ship your worst smashed crank-cases and cylinders to

HOBBIE'S WELDING PLANT, Hampton, Iowa

WELDING AND BRAZING

Your Broken Auto and Machinery Parts Repaired. Prompt Service. Efficient Workmanship.

COLUMBUS WELDING SHOP

294-96 N. Third St. Columbus, Ohio

WELDING

Prompt Service — Prices Reasonable — Work Guaranteed. Automobile Stamping and Sheet Metal Work. Special Welding Compounds for Sale. WM. GREEN MFG. & WELDING CO., Harvey, Ill.

WE WELD CYLINDERS, CRANK CASES, GEAR CASES. Also weld and straighten Auto Frames, Blacksmithing, Leaf Springs, etc. All Our Work Guaranteed.

CROWN WELDING WORKS, Inc.

157 West 54th St. New York City

HELP & SITUATIONS WANTED

Stockroom Man— —WANTED—

A First-Class Stockroom Man
by biggest auto distributor in Central West

Must have executive ability—know
automobile parts—Cadillac
preferred.

Address Box E 442, c/o Motor Age,
Chicago, Ill.



SPROCKETS CHAINS AND DIFFERENTIAL

IN STOCK OR ORDER
SEND FOR NEW CATALOG

Cullman Wheel Co. 1341 Altgeld St. Chicago

SOLE DISTRIBUTORS

Automobile Construction & Engineering Company

3328 Ludlow Street, Philadelphia, Pa.

SUB-DISTRIBUTORS

N. A. PETRY CO., Inc., 1309 Race St., Philadelphia, Agents for Penna. and Atlantic Coast States, South.

A. H. COATES, 442 Market St., San Francisco, Cal., Western Representative for North and South: West of Denver.

THE AUTOMOBILE CATECHISM

The book for every motorist

Now on sale for \$1.25 Regular price \$2.50

FOR FURTHER PARTICULARS WRITE

THE CLASS JOURNAL CO.

910 S. Michigan Avenue (42) Chicago



ST. LOUIS BATTERY CHARGER

SIZES SUITABLE
FOR GARAGES
AND INDIVIDUALS

Write for catalog

ST. LOUIS ELECTRICAL WORKS

Arlington & Easton Aves.
ST. LOUIS, MO.



The Simplex (Short-turn)

Automobile Trailer

Quickly attached to any automobile. Light, durable. Trails in the track of the automobile. Will not skid. A modern necessity at a nominal price. Write for liberal dealer proposition. THE SIMPLEX SHORT-TURN GEAR CO. Dept. G, Anderson, Ind.



BROWN Impulse Tire Pump

Why bother with gears, brackets and etc., when a Brown Pump can be attached to your motor in an instant and always ready for use. Outfit is complete with Q. D. Plug, hose, gauge and etc. Price \$12.00.

Send for Leaflet.

THE BROWN COMPANY

120 Bellevue Ave. Syracuse, N. Y.

"ELEKTRA Brake Lining saved us that time"



In emergencies you've got to "call for help" on your brake linings. Upon the responsiveness of your brakes depends the safety of your car and its passengers. A good brake lining is simply good insurance. Consider it as such by getting the best obtainable—

ELEKTRA ASBESTOS FRICTION BRAKE LINING

Made of selected asbestos, chemically combined (by a patented process) with an indestructible metal, and offering a very high coefficient of friction. That is why it will not burn, char, or slip; why oil, water or vapor have no effect upon it. In point of wear and service, it has no superior. Write for sample and complete information.

THE F. L. HORTON MFG. COMPANY
Whittier Street Boston, Mass.



There are two kinds of
comfort—body and
mind—you get both with



Road Smoothers

QUICKLY APPLIED TO YOUR FORD CAR

They give you the body comfort that comes from motoring "relaxed" in a smooth riding car—regardless of the road's roughness.

They give you mind comfort—that freedom from the tiring effort of steering around bumps and ruts so common to the average road.

K-W Road Smoothers give you this enviable comfort because their design combines these four vital factors: a spring to effectively take up the shock; an anti-rebound air chamber to check the rebound; anti-side-motion links to prevent side-rocking and swaying; a construction that does not interfere with the steering.

Sold by reliable dealers everywhere. Write for booklet, "That Satisfied Feeling."

THE K-W IGNITION CO.
2835 CHESTER AVE. CLEVELAND, OHIO, U.S.A.
Manufacturers of the 125,000 K-W Master Vibrators

Index to the

Allen Auto Specialty Company..... 111
Atwater Kent Manufacturing Works..... 100
Automobile Construction and Engineering Co. 109

Bearings Company of America..... 96
Blood Brothers Machine Company..... 94
Bosch Magneto Company..... 97
Braender Rubber and Tire Company..... 96
Brittson Manufacturing Company..... 92
Brown Company..... 109
Buda Company..... 88

Champion Ignition Company..... Cover
Champion Spark Plug Company..... 49
Clearing House..... 102 to 109
Columbia Axle Company..... 112
Columbus Varnish Company..... 93
Commerce Motor Car Company..... 67
Connecticut Telephone & Electric Company.. 82
Continental Motor Manufacturing Company.. 98
Corcoran Lamp Company..... 100
Cullman Wheel Company..... 109
Cummins-Monitor Auto Sales Company..... 73
Cutler-Hammer Manufacturing Company.... 101

Dayton Engineering Laboratories Company.. 94
Detroit Battery Company..... 95
Detroit Steel Products Company..... 91
Dodge Brothers..... 68
Double Seal Tire Valve Company..... 98
DuPont Fabrikoid Company..... 92
Dyneto Electric Company..... 94

Eisemann Magneto Company..... 95
Electric Auto-Lite Company..... 98

Ford Motor Company..... 95
Foster, C. H..... 80

Gabriel Manufacturing Company..... 89
Garford Manufacturing Company..... 89
Gibson-Hollister Manufacturing Company.... 96
Gray & Davis, Inc..... Front Cover
Grossman, Emil, Manufacturing Company, Inc. 96
Gulf Refining Company..... 90

Hartford Suspension Company..... 99
Hawthorne Manufacturing Company.... 60 and 61
Heinze Electric Company..... 98
Henney Buggy Company..... 69
Horton, F. L., Manufacturing Company..... 110
Houk Manufacturing Company..... 76 and 77
Hudson Motor Car Company..... 78
Hyatt Roller Bearing Company..... 100
Hydraulic Pressed Steel Company..... 100

Interstate Electric Company..... 93
Inter-State Motor Company..... 94
Ironclad Tire Company..... 90

Jackson Automobile Company..... 81
Jeffery, Thos. B., Company..... 83
Johns-Manville, H. W., Company..... 62 and 63

K. W. Ignition Company..... 110
Kimball Tire Case Company..... 96
Kissel Motor Car Company..... 57
Kokomo Electric Company..... 98

Laidlaw Company, Inc..... 100
Leece-Neville Company..... 101
Lewis Spring and Axle Company..... 75
Losee, J. S..... 101

MacGregor, John, Company, Inc..... 101
Majestic Manufacturing & Specialties Company 90
Manzel Brothers Company..... 87
Mayo Manufacturing Company..... 91
McQuay-Norris Manufacturing Company.... Cover

Advertisements

Mercer Automobile Company.....	100
Metz Company.....	92
Midgley Tire and Rubber Company.....	96
Miles Manufacturing Company.....	91
Miller Rubber Company.....	101
Moline Automobile Company.....	98
Mosler, A. R., and Company.....	95
Mutty, L. J., Company.....	92
Mutual Motor Car Company.....	97

National Caburetor Company.....	55
National Motor Vehicle Company.....	70
National Rubber Company.....	100
New Departure Manufacturing Company....	1
New Jersey Car Spring and Rubber Company	101
New York and New Jersey Lubricant Company	95
Nordyke and Marmon Company.....	97

Oakes Company.....	97
O'Bannon Corporation.....	94

Pantasote Company.....	93
Perkins-Campbell Company.....	99
Picard, A. J., and Company.....	95
Pittsburgh Model Engine Company.....	94
Prest-O-Lite Company.....	100
Pyrene Manufacturing Company.....	91

Quaker City Rubber Company.....	56
---------------------------------	----

Rajah Auto Supply Company.....	99
Remy Electric Company.....	Back Cover
Republic Rubber Company.....	97
Royal Equipment Company.....	52 and 53
Runen Manufacturing Company.....	98
Rutenber Motor Company.....	97

Salisbury Wheel and Manufacturing Company	94
Savidge Steering Device Company.....	95
Saxon Motor Company.....	66
Scripps-Booth Company.....	88
Shaler, C. A., Company.....	99
Shanhouse Company.....	99
Sheldon Axle and Spring Company.....	58 and 59
Simms Magneto Company.....	90
Simplex Short-Turn Gear Company.....	109
Sparks-Withington Company.....	98
Sphinx Motor Car Company.....	96
Splittorf Electrical Company.....	72
Spring Leaf Lubricator Company.....	101
St. Louis Electrical Works.....	109
Standard Motor Truck Company.....	99
Standard Thermometer Company.....	97
Stevens and Company.....	97
Stewart-Warner Speedometer Corporation...	74
Stromberg Motor Devices Company.....	101
Studebaker Corporation.....	4

Thompson Electric Clock Company.....	96
Twitchell Gauge Company.....	111

U. S. Light and Heat Corporation.....	79
Universal Trailer Company.....	93

Van Sicklen Company.....	51
Victor Auto Parts Company.....	99

Wadsworth Manufacturing Company.....	87
Westcott Motor Car Company.....	54
Weston Electrical Instrument Company.....	99
Wheeler and Schebler.....	50
White and Bagley Company.....	2
Willard Storage Battery Company.....	85
Winton Company.....	94
Wonder-Mist Company.....	64 and 65
Woodstock Hotel.....	84

Zenith Carburetor Company.....	71
--------------------------------	----

The ALLEN TIRE CASE

When an unused spare shoe which

you have been carrying around for six months (or three months, as the case may be), EXPOSED to all the elements, is finally put to work, and then unexpectedly "blows"—don't blame the unfortunate shoe. You could have saved it yourself with the Allen Tire Case, the perfect protection for spare shoes. It's the real "SAFETY FIRST" for service from spare shoes, and again—just remember that when you need a spare shoe you need it badly. Moral!—Put Allen Tire Cases on your spare shoes now! \$3.00 and up at your dealer's, or from the manufacturer. Booklet on request. To test the air pressure in your tires there's nothing


"just as good" as the \$1.00 handy, accurate

The Allen Auto Specialty Co.

Manufacturers
1926 Broadway
New York
1627 Michigan Ave.
Chicago

ALLEN TYROMETER

TIRE PRESSURE GAUGE



Twitchell

The first question the tire adjuster will ask is: "Have you kept your tires inflated to the pressure we prescribe?"

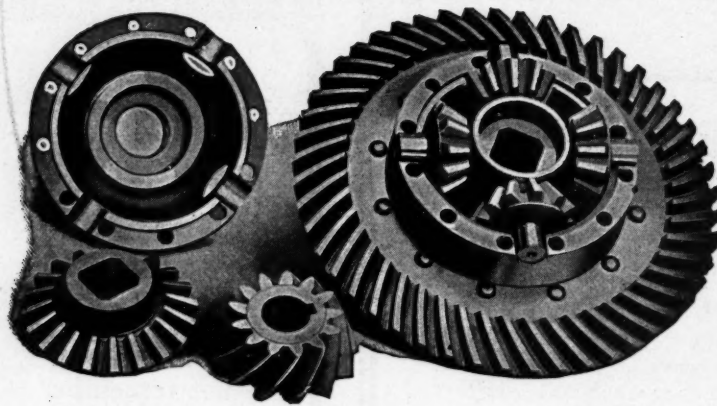
If you haven't---and the condition of the tire will show whether you have or not---he will allow nothing for their premature destruction or blow-out.

Test your air pressure daily with a
TWITCHELL AIR GAUGE
and save your tires Price \$1.00

THE TWITCHELL GAUGE CO.
1204 MICHIGAN AVE.
CHICAGO, ILL.

Tire Insurance

for One Dollar



COLUMBIA AXLES

As an additional assurance of quiet running, Columbia Rear Axles carry spiral bevel gears in the differentials.

Accredited engineers and engineering societies concede beyond any question the superiority of spiral bevels over the original straight bevels.

Not alone because of the almost absolute noiselessness of the spiral gear but because of its better lasting qualities as well.

Being the most efficient bevel gear obtainable it follows as a matter of course that spiral bevel gears are used in Columbia axle construction.

Other characteristics of the rear axles are, three-quarter floating construction, taper roller bearings, internal and external brakes; pressed steel housings.

Front axles are I-Beam forgings, heat-treated with thrust bearings in yokes to insure easy steering.

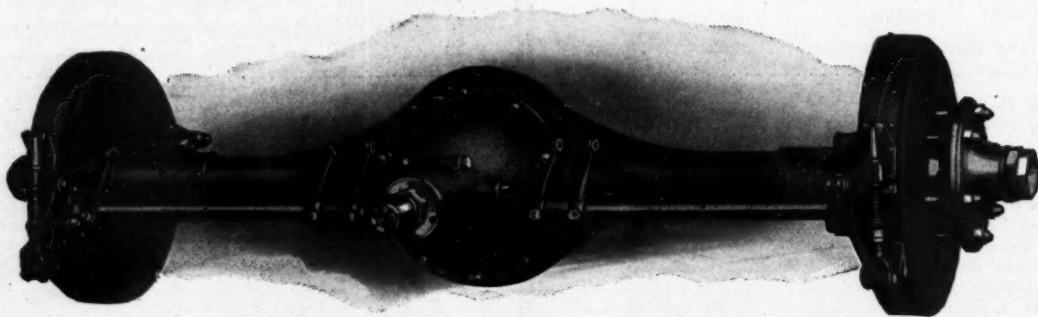
THE COLUMBIA AXLE COMPANY

Cleveland

826 East 72d Street

Ohio

Manufacturers also of Torbensen Internal Gear Driven Axles



When Writing to Advertisers, Please Mention Motor Age

700,000
*Ford Owners have
 been waiting
 for this—*

It's Here!!



McQUAY-NORRIS
LYNITE PISTONS
ALUMINUM

The aluminum piston has arrived. It's the latest sensation in the automobile industry—the most wonderful mechanical improvement engineers have hit upon in years.

LYNITE Aluminum Pistons are die cast by a patented process, the right to use which is possessed, exclusively by the Lynite Man-

ufacturers. The most important of many advantages they possess over sand cast aluminum pistons is their exceptional strength and hardness—insuring great resistance to wear.

We are specializing in furnishing a set of four McQuay-Norris LYNITE Aluminum Pistons—

Completely Equipped with 12

LEAK-PROOF

Piston Rings

MADE BY McQUAY-NORRIS MFG. CO.

for Ford Cars. We are going to open up a market that covers one-third of all cars in use today in this country, advertising our proposition to Ford Owners everywhere.

Every Ford Car in your community is a prospect for the dealer who handles McQuay-Norris LYNITE Pistons, LEAK-PROOF Ring equipped. Every Ford Owner is going to read or hear about them, and he won't pass up arguments in their favor like these:

McQuay-Norris LYNITE Pistons are two-thirds lighter than the ordinary cast-iron pistons he is using—that means quicker acceleration, higher speed, less vibration, lighter

bearing pressure and longer bearing life. Friction is 50 per cent less—that means lower consumption of oil and saving of power. They are much cooler—that means less carbon deposit on the piston head and clean spark plugs. This offer of ours is a bargain that was never offered to a Ford Owner before. The 12 LEAK-PROOF Piston Rings alone retail for \$18.00. This LEAK-PROOF means the four pistons are sold for the ridiculously low price of \$12.00.

It's a combination that sells itself—a bonanza for any dealer that handles it. Get started on this early and secure the cream of the demand.

Send for new illustrated folder on LYNITE Aluminum Pistons—full of valuable information. Also FREE booklet—"To Have and to Hold Power"—explaining the merits of LEAK-PROOF Piston Rings.

**4 Pistons
 fully
 equipped**

McQuay-Norris Mfg. Co., Dept. M St. Louis, U. S. A.

Canadian Factory: W. H. Banfield & Sons, 120 Adelaide Street, West, Toronto.

BRANCH OFFICES—**New York:** 1919-29 Broadway at 64th St. **Chicago:** Suite 718 Michigan Blvd. Bldg. **Philadelphia:** 1111 Fidelity Life Bldg. **Pittsburg:** 902 Second Nat. Bank Bldg. **San Francisco:** 164 Hansford Bldg. **Los Angeles:** 224 Central Bldg. **Cincinnati:** 717 First National Bank Bldg. **Seattle:** 1001 American Bank Bldg. **Kansas City:** 513 New Nelson Bldg. **St. Paul:** 308 American Nat. Bank Bldg. **Dallas:** 509 Juanita Bldg.

\$30.00



REMY

STARTING

LIGHTING

IGNITION

"Bright as Day"

REMY ELECTRIC CO.
ANDERSON INDIANA

*Liberal Exchange
Proposition*